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Grand Mesa, Uncompahgre, And Gunnison National Forests

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Biological Evaluation and Management Indicator Species Report for Wildlife

Spruce Beetle Epidemic and Aspen Decline Management Response

Grand Mesa, Uncompahgre, and Gunnison National Forests,
Delta, Garfield, Gunnison, Hinsdale, Mesa, Montrose, Ouray, Saguache, and San Miguel Counties, Colorado

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INTRODUCTION

The Grand Mesa, Uncompahgre, and Gunnison National Forests (GMUG NF) propose to implement the Spruce Beetle Epidemic and Aspen Decline Management Response (SBEADMR) project. This project includes commercial silvicultural treatments, noncommercial prescribed fire and mechanical treatments, and hazard tree removal. Treatments are targeting Engelmann spruce forests affected by the spruce bark beetle epidemic and aspen forests affected by Sudden Aspen Decline (SAD) across the GMUG NF. The purpose of this document is to present the analysis of the proposed project alternatives and disclose impacts on terrestrial wildlife species designated as Sensitive by the Rocky Mountain Region Regional Forester (FSM 2670.31-2670.32), and species identified as Management Indicator Species (1982 Planning Rule 36 CFR 219.19(a)(6)) for the GMUG NF with a primary objective of ensuring that Forest Service actions do not contribute to loss of viability of, or contribute to trends toward federal listing of, any wildlife species.

Forest Service policy requires that a review of programs and activities, through an effects analysis document (referred to in current Forest Service policy as a biological evaluation or BE), be conducted to determine their potential effect on threatened and endangered species, species proposed for listing, and Regional Forester-designated sensitive species (FSM 2670.3). Under the ESA, the effects analysis report is called a biological assessment (BA) and must be prepared for federal actions that are "major construction activities" to evaluate the potential effects of the proposal on listed or proposed species and critical habitats. The contents of the BA are at the discretion of the federal agency, and will depend on the nature of the federal action (50 CFR 402.12(f)). A BE may be used to satisfy the ESA requirement to prepare a Biological Assessment. Preparation of a Biological Evaluation as part of the NEPA process ensures that TEPS species receive full consideration in the decision-making process. A separate biological assessment was prepared addressing threatened, endangered, and proposed species (available in the project record).

The 1982 Planning Rule 36 CFR 219.19(a)(6) related to Management Indicator Species (MIS) requires the Forest Service to produce a unique list of species to represent Forest communities or ecosystems. These species and the ecosystems in which they represent must be considered for each project to evaluate consistency with the Forest Plan. The National Forest Management Act (NFMA) requires that Forest Plans provide for a diversity of plant and animal communities. Under the 1982 NFMA regulations, a "viable population": the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area (36 CFR 219.19). The "planning area" is the area of the National Forest System covered by the forest plan (36 CFR 219.3). Under the 2005 NFMA regulations, there is no viability requirement, but a project must be consistent with the Land and Resource Management Plan (referred to as Forest Plan).

DESCRIPTION OF THE PROPOSAL

Background and Location

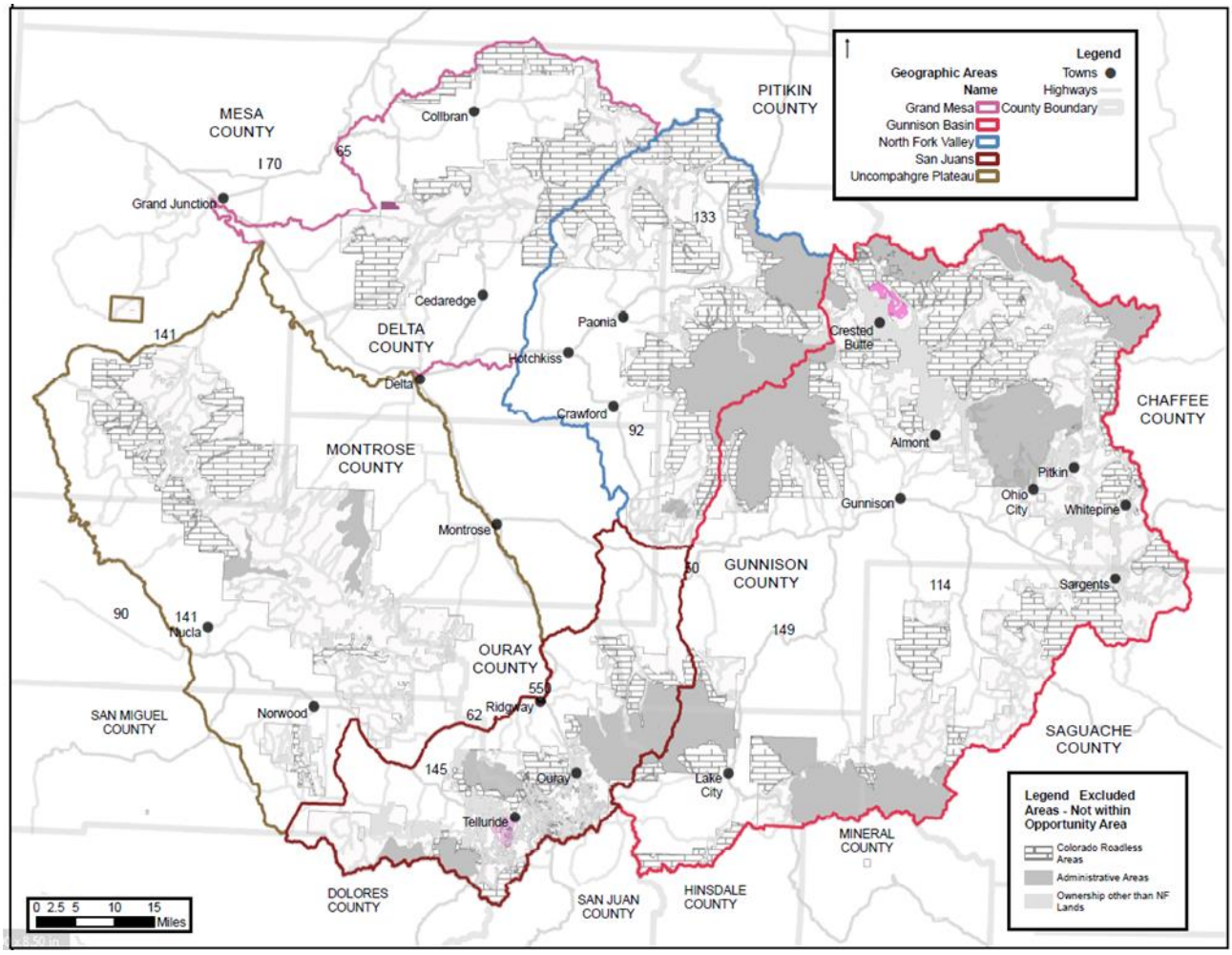
The Grand Mesa, Uncompahgre, and Gunnison (GMUG) National Forests are located on the western slope of the Rockies and into the Colorado Plateau (Figure 1). The GMUG covers

3,161,900 acres across diverse vegetation ranging from semi-desert, sagebrush, piñon-juniper, mountain shrublands, and ponderosa pine to lodgepole pine, Engelmann spruce, subalpine fir and quaking aspen. There are also significant areas above tree line, in the alpine zone.

Elevations of the Grand Mesa, Uncompahgre, and Gunnison National Forests range from about 5,800 ft. (1,770 m) on the west foothills of Battlement Mesa, to over 14,200 ft. (4,330 m) on the high peaks of the San Juan and Saguache Mountains. All of the Grand Mesa, Uncompahgre, and Gunnison National Forests are on the western slope, as the Continental Divide forms the eastern and southeastern boundaries of the National Forests.

Annual precipitation on the GMUG ranges from about 10 inches (25.4 cm) per year in the bottom of the Gunnison Basin, to over 50 inches (127 cm) per year on the high peaks of the San Juan and Elk Mountains. Precipitation largely parallels elevation, with some notable exceptions in the rain shadows in the bottom of the Upper Gunnison Basin and the Cochetopa Hills area. Thus the higher precipitation areas are those associated by the higher mountain ranges – the Elk and West Elk Mountains, the San Juan Mountains, and the Grand and Battlement Mesas. The Cochetopa Hills and the Uncompahgre Plateau are on the low end of precipitation range for the Forests.

Figure 1. Vicinity Map - SBEADMR Planning Area and the five geographic Areas used in the Analysis.



The GMUG has experienced approximately 223,000 cumulative acres of spruce beetle mortality and 229,000 acres of Sudden Aspen Decline (SAD) accumulated over the past decade. Impacts have increased rapidly in recent years. Neighboring San Juan and Rio Grande National Forests have been experiencing a massive spruce beetle outbreak for the past decade. The spruce beetles have spilled over the Continental Divide into the GMUG. The landscape south and east of Gunnison, Colorado bordering the Rio Grande National Forest is one of the hardest hit areas on the GMUG. From 2013-2014, the cumulative acreage affected by spruce beetles increased by approximately 64,000 acres on the GMUG (DEIS, 2015). Mortality in spruce stands is expected to continue at relatively high levels for several years to come.

A detailed description of the background and setting for this project can be found in the SBEADMR Final Environmental Impact Statement.

Purpose and Need

The purpose of the project is to reduce the safety threats of falling, dead trees and of managing wildfires on the landscape (safety); improve the resiliency of stands at-risk of insect and disease (resiliency); and to treat affected stands via recovery of salvageable timber and subsequent re-establishment of desired forest conditions (recovery). Given the substantial mortality of spruce-fir and aspen forests on the GMUG over the past decade, the need for the project is to manage forest vegetation to bring current and foreseeable conditions closer to desired conditions on landscapes available for active management. On these landscapes, vegetation management would be used to help sustain or promote potential natural vegetation types. Desired conditions include a balance of habitat structural stages, tree species composition, and seral stage distributions that are appropriate for each vegetation type across the geographic areas of the GMUG. Furthermore, in the context of a changing climate conducive to more frequent and extensive wildfires in forests at high elevation irrespective of tree condition (Westerling et al. 2006, Agee 2007; Funk 2014; Rangwala and Rondeau, unpub.), desired conditions for fire and fuels management include more locations across the landscape from which firefighters can safely and effectively manage or suppress fires for values at risk and/or resource benefit.

PROPOSED ACTION AND ALTERNATIVES TO IT

Alternative 1 (No Action Alternative)

The National Environmental Policy Act (NEPA) requires the study of the No Action Alternative and directs that this alternative be used as a basis for comparing the effects of the Proposed Action and other alternatives.

The No Action Alternative assumes that no implementation of the proposed action or the other action alternative would take place within the project area. This alternative represents no attempt to actively respond to the issues, purpose and need for action, or concerns identified during public scoping for this project. There would be no effort to modify existing conditions, unless authorized by other decisions. Other management actions including vegetation management projects are authorized and would likely continue to be authorized within the project area and timeframes analyzed in this EIS. These other projects would proceed under separate NEPA

analyses. Other related projects which are currently authorized are noted in Chapter 1 under "Other Related Efforts."

ACTIVITIES COMMON TO ALL ACTION ALTERNATIVES

The following sections provide additional information regarding activities common to all action alternatives.

Scope and Scale of Treatments

On the GMUG, approximately 223,000 cumulative acres have experienced spruce beetle mortality and 229,000 acres have experienced Sudden Aspen Decline. Due to budget constraints, the scale of the epidemic, and the magnitude of affected and potentially affected acres across all terrain of the forest, the Forest Service cannot treat all affected acres. Although landscapes of various extent are analyzed in this EIS to afford flexibility for land managers to respond in real-time to rapidly changing forest conditions, the Forest is proposing and analyzing treatments of a maximum of 120,000 acres, or 4% of the GMUG, in equal proportions between commercial and noncommercial treatments. These treatments would be implemented over an approximately 8-12 year implementation span. Annual acres treated are limited by personnel and budget constraints in the Forest Service.

All commercial treatment would occur on lands identified as suitable for timber production as defined by the Forest Plan (GMUG Forest Plan Amendment, 1991, pages F-1-F-7). Spruce-fir and spruce-aspen mix are considered for commercial treatment. At the time of the analysis, there is no existing market for aspen; unless a market were to emerge during the implementation timeframe of this project, commercial treatments in aspen would not be likely to occur. In order to commercially treat aspen areas analyzed in SBEADMR, the GMUG would need to determine that this NEPA document sufficiently disclosed the effects of such treatments

Priority Treatment Areas Defined

Priority treatment areas (PTAs) in SBEADMR are the maximum extent of geographic area analyzed for potential treatments. Starting with the original opportunity areas within the Draft EIS, the GMUG and CSU Science Team developed a comprehensive spatial modeling process to bring focus and prioritization to the project. After optimizing for a variety of resource and operational variables, each PTA was validated by GMUG specialists with professional knowledge of the ground (See Appendix F of the Final EIS for further detail). Whereas the project area ranged from 300,000-718,000 acres in the Draft EIS, the sum total of the PTAs, potential roadside hazard trees, and additional road construction in the Final EIS now range from 127,000 acres to 208,000 acres.

As in the Draft EIS, a *subset* of the analysis area (PTAs) for Alternative 2 would be treated over the life of the SBEADMR project. Only 60,000 acres of commercial treatment would occur, and only 60,000 acres of noncommercial treatment would occur. The GMUG intentionally selected PTAs that total approximately 2-3x the extent of actual treatments in order to monitor and adapt

the treatment type and location to the changing forest conditions. However, once the IDT took into account the other vegetation types within the *noncommercial* PTAs – non-target vegetation that wouldn't be treated—the total noncommercial PTA acres dropped to 77,000 acres. Therefore, approximately 1 out of every 1.3 acres analyzed for noncommercial treatment in Alt 2 would be completed. In contrast, in Alternative 3, the PTAs are limited to the WUI, and this considerably reduced the total analysis area. Unlike Alternative 2, in which a subset of PTAs would be treated, each PTA in Alternative 3 would be treated.

As noted in the Draft EIS, the original opportunity areas—and hence, the PTAs—are limited to spruce and aspen forest types outside of Wilderness, Research Natural Areas, Special Interest Areas, Cultural Areas, and National Natural Landmarks. Additionally, Colorado Roadless Areas (CRAs) are not included, as the limited agency capacity will be applied most effectively to conduct active management treatments to less controversial areas. Treatments in CRAs would be proposed and authorized under separate NEPA processes.

Adaptive Implementation & Continued Public Involvement

The Forest Service cannot significantly alter the current infestation or rate of decline in spruce stands, but management of associated hazards, economic opportunities, and resilience, as detailed in the purpose and need, are the core of this project. Nor can it accurately project the ultimate location and scale of eventual beetle activity. To achieve the purpose and need in the context of rapidly changing conditions in spruce and aspen stands across the landscape, SBEADMR relies on an adaptive implementation framework to prioritize the sequence and determine precise layout of successive treatments within the analyzed PTAs. Treatment design, incorporating additional monitoring questions, reviewing the effects of previous treatments, and adjusting management towards desired conditions and away from undesirable conditions would also be conducted via the adaptive implementation approach. At 36 C.F.R. § 220.3 (2010), adaptive management is defined as "a system of management practices based on clearly identified intended outcomes and monitoring to determine if management actions are meeting those outcomes; and, if not, to facilitate management changes that will best ensure that those outcomes are met or re-evaluated. Adaptive management stems from the recognition that knowledge about natural resource systems is sometimes uncertain". Specific decision-making triggers for adaptive implementation are identified in Table 1, below. Some triggers related to meeting desired conditions, and other pertain to maintaining impacts within established legal and/or project limits.

Public involvement is critical throughout implementation, and is explicitly incorporated into the approach, as detailed below and in *Appendix E of the Final EIS.*

The adaptive implementation and monitoring framework defines a) a cycle of checkpoints and b) an associated toolbox, discussed in further detail below.

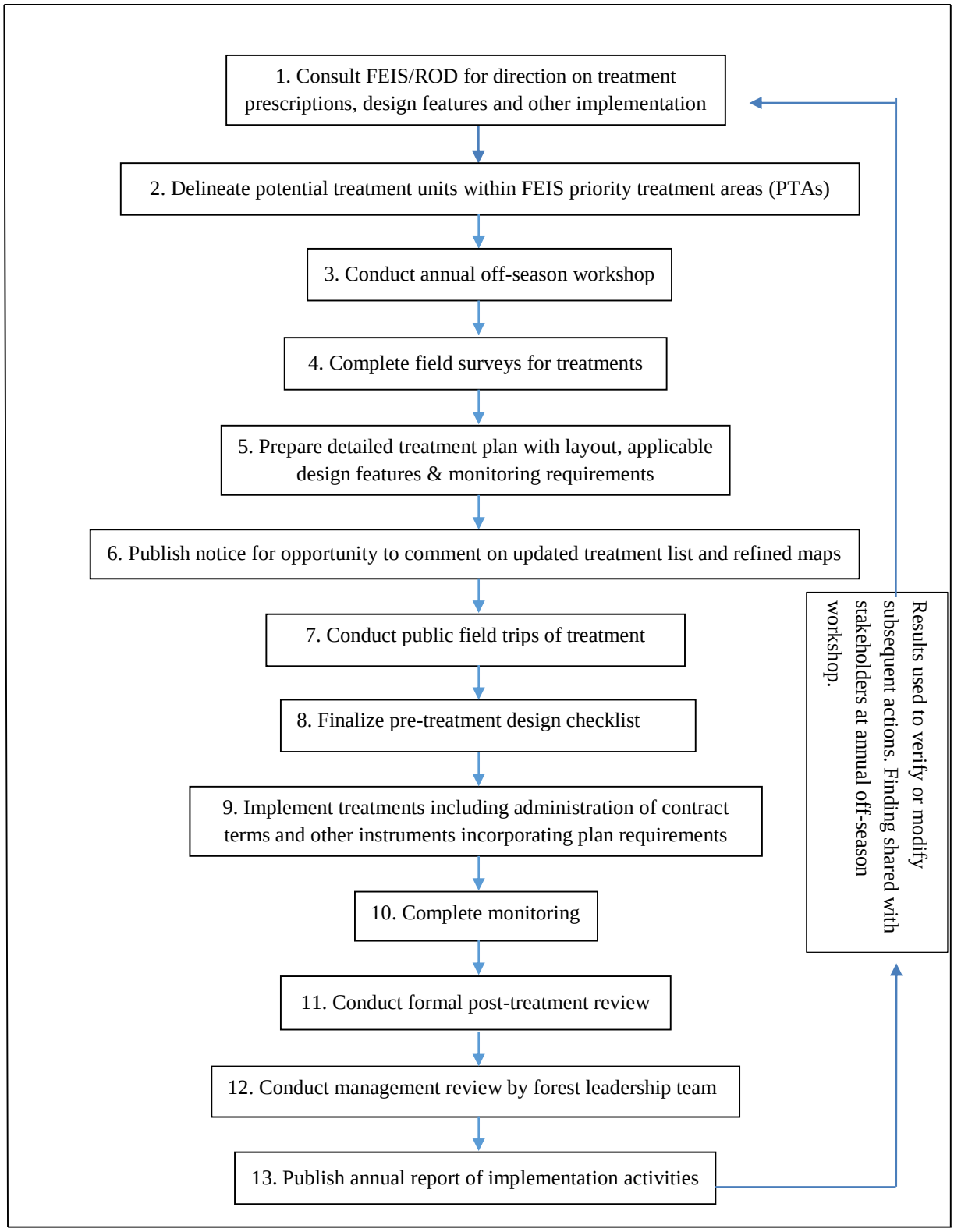


Figure 2. Adaptive implementation and monitoring framework for SBEADMR

Checkpoints

The checkpoints in the adaptive implementation cycle would involve public stakeholders, a science team, and Forest staff. Figure 2 indicates how stakeholders, the Forest Service, and the Science Team will work together to complete all five parts of the Adaptive Implementation & Public Involvement Framework.

Checkpoints for the adaptive implementation will include five major components:

1) Public notice and comment on annual basis for upcoming cycle of treatments;
2) Pre-Implementation treatment planning;
3) Post-Treatment implementation review focusing on design feature compliance;
4) Annual monitoring review/evaluation and new science summary with stakeholders and science team;
5) Annual Management Review.

The GMUG recognizes that a landscape-scale project analysis such as SBEADMR is difficult for the public to comment on and to be assured that effects are adequately disclosed. Due to the adaptive nature of the proposal and in response to public comments on the Draft EIS, the GMUG will annually provide public notice and opportunity to comment on the upcoming specific set of SBEADMR treatments. Public comments will assist GMUG staff in determining the adequacy of the original effects analysis and of the original project components for each successive set of treatments.

Opportunities for stakeholders to influence implementation would be confined by the sideboards of the selected alternative, as outlined in the Final Record of Decision (ROD) and Environmental Impact Statement (EIS). Further, the Forest Service retains the authority to make final decisions related to location, extent and types of treatments planned and completed consistent with the ROD/EIS. However, if at any-time stakeholders have specific questions or concerns related to any aspect of implementation under SBEADMR, Forest staff would be responsive and take steps to accommodate stakeholder input to the greatest extent practicable. The process outlined here would be required by the ROD. See *Appendix E* of the Final EIS for further detail.

Implementation Toolbox

The implementation toolbox defines the range of silvicultural and fire prescriptions and design features for treatment implementation and provides a mechanism for monitoring and documenting compliance. These tools would be used throughout the adaptive implementation cycle outlined above. The prescriptions and design features are incorporated into both action alternatives and effects analyses; however, the application of an individual prescription and a suite of design features will depend upon on-the-ground conditions at the time of implementation. These conditions, or triggers for use, are defined in Chapter 3, resource sections.

Most tools are detailed further in an associated referenced appendix of the Final EIS. Tools include:

- Triggers for Adaptive Implementation – In response to public comments, decision-making triggers from the Draft EIS are explicitly identified in one table in the Final EIS. See *Table 1. Decision-Making Triggers for Adaptive Implementation in SBEADMR.*

- Silvicultural Prescription Matrix – would be used to identify which and how various stands will be treated to achieve management objectives. Detailed silvicultural prescriptions will be completed by a certified silviculturist by comparing current versus desired vegetative conditions. *See Appendix A of the Final EIS.*

- Design Features – would be applied to treatments to minimize or avoid undesirable impacts to resources including, but not limited to, vegetation, soils, water, wildlife and cultural resources. Design Features are incorporated into both action alternatives and their effects analyses. The appropriate design features would be applied when surveys or management activities indicate a need to do so. It is also assumed that design features will be implemented as designed and in a readily visible way, effective. Analysis completed in this document assumes implementation of the appropriate design features *See Appendix B of the Final EIS.*

- Pre-Treatment Checklist – tracking tool would document that all required surveys and compliance checks for an individual treatment have been completed. The checklist will also identify design features that would be applied to a particular treatment. For example, the presence of a Northern goshawk nest in a treatment area would trigger the avoidance/protective measures as specified in the design features of the EIS. As such, the checklist would assure treatments are implemented consistent with the EIS. The checklist will also be used to confirm compliance with the Forest Plan. *See Appendix C of the Final EIS.*

- Annual Interdisciplinary & Management Review – a monitoring method that provides documentation that treatments are implemented as planned. The IDT review, combined with monitoring results and science team input, would provide feedback to forest managers about how to best design and implement future treatments in the treatment area. The results of this monitoring, in conjunction with best available science, will identify relevant improvements to procedures or exemplary practices to benefit future treatments authorized by the SBEADMR record of decision. *See Appendix D* of the Final EIS

- Public Engagement in Adaptive Implementation -- the phases, principles, and activities of public engagement throughout the life of the SBEADMR project. The primary goal is to engage diverse groups and individuals so that they might identify common problems, interests, and potential solutions. *See Appendix E of the Final EIS.*

NEPA Sufficiency

In some cases, changed conditions may bring into question whether the scope and range of effects disclosed in this analysis are exceeded. Typically, a change in a design feature to render it more effective to protect resource values or to achieve desired outcomes would remain within the

scope and range of the effects analysis. Elimination of a design feature intended to minimize effects would likely be outside the range and scope of the analysis. A change in assumptions analyzed in the EIS could also trigger a NEPA sufficiency review. For example, it was assumed that the level of impact to habitat supporting Canada lynx would stay within Forest-level caps identified in the Southern Rockies Lynx Amendment (SRLA). These caps would be tracked over the life of the project, and if tracking indicates a pending exceedance in any given year, no additional treatment would be permitted until additional NEPA and additional consultation with Fish and Wildlife Service was completed. Substantive changes would require the Forest to undertake an interdisciplinary review of the sufficiency of the NEPA documentation prepared for this treatment.

As noted above, public notice and comment period on an annual basis for out-year treatments will serve an important role to determine the continued sufficiency of this NEPA document.

During sufficiency reviews, the GMUG may determine the information in the original decision is still valid and is not in need of correction or supplement. However, if that review reveals a need for a correction, supplement or revision to the original decision, then the specific process to correct, supplement, or revise the analysis would be used, as specified in FSH 1909.15(18.2).

Table 1. Decision-Making Triggers for Adaptive Implementation in SBEADMR. Red light triggers correspond with a legal standard/project standard that cannot be crossed, whereas a yellow-light trigger indicates that a resource is being affected negatively, signaling the need for increased mitigation of effects, a change in management approach, or slowing of the pace of implementation (Schultz & Nie, 2012).

Desired Condition	Indicator(s)	Unit of Measure	Methods	Scale	Frequency	Yellow Light Trigger	Adaptive Action	Red Light Trigger	Adaptive Action	Regulatory Requirement
Management of the Treatment for: Vegetation, Wildlife, Visuals Objectives										
Maintain structural diversity of vegetation at the watershed scale (diversity unit - 6th HUC).	5-15% or more of vegetation at 6th field watershed unit is in an old growth forest classification, where biologically feasible.	Habitat structural stages 4A, 4B and 4C.	Prior to treatment planning, determine the amount of live 4A, 4B and 4C in watershed.	Diversity unit - 6th field HUC	During treatment planning OR complete quick assessment at the watershed scale prior to treatment planning.	Amount of habitat structural stages 4A, 4B, 4C pre-treatment is less than 20%.	**Limited overstory mortality**: Plan treatments to ensure minimum old forest classifications are maintained. **High overstory mortality** - retain pockets of live habitat structural stages 4A, 4B and 4C to the greatest extent practicable.	Amount of habitat structural stage 4A, 4B and 4C pre-treatment is less than 5%.	Same as yellow.	**LRMP**
Maintain soil productivity, minimize human-caused erosion and maintain integrity of associated ecosystems (III-73 01a)	Past activities and proposed activities would contribute to a combined detrimental soil disturbance that is above or approaching the 15% threshold of a treatment unit.	Percent of detrimental soil disturbance within a treatment unit (DSD includes: compaction, rutting, burn severity, displacement, surface erosion and mass movement).	Implement Design Features WQSP-4, 5A, 5B, and 7B in accordance with requirements of the treatment design checklist. Spot check treatment units using accepted soil monitoring protocols.	Treatment	Pre-treatment checklist and, as triggered, post-treatment monitoring	Pre-treatment review in FACTS confirms past ground-based activities in proposed treatment area.	Complete pre-treatment survey to determine detrimental soil disturbance percentage. Work with IDT to design treatment to maintain the cumulative detrimental effects from project implementation and rehabilitation should not exceed the conditions prior to the planned activity and should move toward a net	Upon completion of pre-Rx survey and considering net impact of proposed treatment, it is determined that net detrimental soil disturbance post-treatment would exceed 15% of the activity area.	Modify treatment boundaries and/or exclude this treatment until further soil restoration activities completed.	LRMP

Desired Condition	Indicator(s)	Unit of Measure	Methods	Scale	Frequency	Yellow Light Trigger	Adaptive Action	Red Light Trigger	Adaptive Action	Regulatory Requirement
							improvement in soil quality.			
Eliminate/minimize soil damage from machine pile burning	Bare soil, rilling, gullying, and soil movement within machine pile burn scars	Percent of machine pile burn scars, and area within each burn scar, without vegetation or showing signs of rilling, gullying, or soil movement.	Monitor a sample of pile burn scars for bare soil and--on scars located on slopes and in swales--for the presence of rills, gullying, or soil movement.	Treatment	Within 3 years of pile burning	>100 sq ft of burn scar consisting of bare soil; minor rilling or gullying present within or adjacent to burn scar; minor deposition of soil downslope of scar.	Treatment of bare soil and erosion according to District protocols, may include one or two of the following: addition of mulching, scarification, inoculation with adjacent soils, seeding, etc.	>200 sq ft of burn scar consisting of bare soil; multiple rills, or gullying, or gullying 2-3" deep within burn scar; significant deposition of soil downslope of scar.	Treatment of bare soil according to District protocols, may include several or all of the following: addition of mulching, scarification, inoculation with adjacent soils, seeding, etc.	
Lynx-Specific Management										
<30% of lynx habitat in an LAU in a stand initiation structural stage/ silviculturally treated to remove cover for snowshoe hare and does not yet provide winter snowshoe hare habitat. SRLA Standard VEG S1.	Harvest, road construction or other anthropogenic or natural disturbances within lynx habitat.	Acres per LAU	Track acres of management actions and/or natural disturbances reported in FACTS or INFRA (Forest Service databases). To ensure compliance with design Feature WFRP-16.	Lynx Analysis Unit	Annual	25% of lynx habitat in LAU in a stand initiation structural stage (SISS) condition.	Discontinue or reduce acres of treatment in suitable lynx habitat. Stands with extensive over-story morality (>90%) that lack an understory can continue to be treated since they are already considered unsuitable via SRLA. Plan any future actions so 30% threshold is not exceeded.	Fire or spruce beetle results in widespread loss of the understory, leaving >30% percent of the LAU in a stand initiation structural stage.	Discontinue treatments in suitable lynx habitat. Stands with extensive over-story morality (>90%) that lack an understory can continue to be treated since they are already considered unsuitable via SRLA.	Compliance with Southern Rockies Lynx Amendment - Endangered Species Act.
<15% of lynx habitat in an LAU would be regenerated by vegetation management (over 10-year period beginning	Vegetation management that regenerates stands.	Acres treated over 10-year period in LAU	Management actions reported in FACTS. Even-aged treatments - entire stand.	Lynx Analysis Unit	Annual	Vegetation management has regenerated 10% of lynx habitat in LAU. Fuel treatments are	Discontinue or reduce acres of treatment to ensure new (out-year) proposed treatment areas do not exceed the 15%	Vegetation management has regenerated 15% of lynx habitat in LAU. Fuel treatments are	Discontinue treatments in suitable lynx habitat. Stands with extensive over-story morality (>90%) that lack an	Compliance with Southern Rockies Lynx Amendment - Endangered Species Act.

Desired Condition	Indicator(s)	Unit of Measure	Methods	Scale	Frequency	Yellow Light Trigger	Adaptive Action	Red Light Trigger	Adaptive Action	Regulatory Requirement
in 2009). SRLA Standard VEG S2.						exempt from the trigger.	threshold in the LAU.	exempt from the trigger.	understory can continue to be treated since they are already considered unsuitable via SRLA.	
<3% of lynx habitat on the Forest will be thinned. Precommercial thinning and similar practices intended to reduce seedling/sapling density limited to: 200 feet of structures; research studies; conifer removal in aspen.	Actions with intent to reduce seedling/sapling density.	Acres treated	Management actions reported in FACTS	Forest-wide	Annual	2.5% of Forest thinned.	Plan acres of out-year treatments such that they do not exceed the 3% Forest-wide cap.	3% of Forest thinned	Discontinue pre-commercial thinning to ensure forest-wide cap is not exceeded. If additional thinning is needed to accomplish resource objectives, reinitiate consultation as required by the SRLA.	Compliance with Southern Rockies Lynx Amendment - Endangered Species Act.
Watershed Management										
To ensure HUC12 disturbance is less than 25 percent, maintain disturbances from mechanical harvest treatments and roads to less than 25 percent of the HUC12 area. Other natural events (wildfire) could also affect watershed	Weighted[1] acres of mechanical harvest, road construction or other anthropogenic or natural disturbances within the watershed.	Acres per HUC12 watershed	Track acres of management actions and/or natural disturbances reported in FACTS or INFRA (Forest Service databases). To ensure compliance with design Feature WQSP-10.	HUC 12 Watershed	Pre-treatment checklist item	20% of HUC 12 affected.	Discontinue or reduce acres of treatment in watershed so 25% threshold not exceeded.	Wildfire and cumulative management activities result in 25% of HUC12 affected.	Discontinue treatments in suitable watershed until recovery has occurred.	LRMP, Watershed Conservation Practices Handbook.

[1] *See Appendix I, Watershed Cumulative Effects Analysis for explanation of weighting process.*

Desired Condition	Indicator(s)	Unit of Measure	Methods	Scale	Frequency	Yellow Light Trigger	Adaptive Action	Red Light Trigger	Adaptive Action	Regulatory Requirement
integrity and will be tracked when they occur.										

Treatments

Resiliency in the Context of Vegetation Management

Resilience is the capacity of a system to tolerate disturbance without shifting to a qualitatively different state that is controlled by a different set of processes (Resilience Alliance 2012); i.e., the ability of a system to retain its function, structure, identity and feedbacks in the face of disturbance and environmental change (Walker et al. 2004).

A resilient forest ecosystem is a forest that contains the diversity of composition, size, density and pattern that enables it to cope with changing disturbance processes**.** Such an ecosystem is capable of providing various ecosystem services such as wildlife and aquatic habitat for a variety of species, clean water, recreation, and carbon sequestration in the short and long term.

Spruce Recovery and Resiliency

The spruce recovery goals would be met via removal of dead and dying trees (salvage) followed by regeneration from on-site seed sources, re-sprouting of aspen, or tree planting where adequate natural seed sources are lacking. As detailed in the silvicultural prescription matrix (*Appendix A of the Final EIS*), recovery treatments would be designed to retain advanced regeneration and green trees to the maximum possible extent.

Resiliency goals in spruce stands would be met by removal of single trees or group selections of trees where bark beetle impacts are light or in areas yet unaffected by beetles. Resiliency treatments are designed to mimic natural gap dynamics that maintain or encourage multi-storied attributes, with the same considerations for retention of advanced regeneration as noted above. These treatments would be completed in accordance with the Southern Rockies Lynx Amendment, and they are considered a conservation measure for lynx (USDA Forest Service 2008, SRLA). Cuts typically cover only 20-40% of a given treatment unit.

Aspen Resiliency

Aspen and aspen-spruce treatments would consist of coppice cutting, mastication, prescribed fire or removal of single spruce or groups of spruce within a stand dominated by aspen. The treatment goal is to regenerate or maintain aspen; site disturbance through treatment activities and removal of aspen canopies typically stimulates regeneration of aspen from the existing root system. Efforts would be made to prioritize treatments based upon likelihood of aspen persistence, given climate projections and current modeled future distribution by elevation (Rehfeldt et al. 2015).

Adapted Future Action

As a green spruce stand becomes increasingly affected by spruce beetle, the appropriate treatment would trend from an initial planned resiliency prescription to a salvage operation. Because of this changing condition in spruce stands and the corresponding change in the type of

appropriate silvicultural prescription, the FEIS explicitly notes the acres of treatment type based on forest conditions as detected today and also projects the acres of potential treatment type (all salvage) based on the maximum potential extent of the spruce beetle epidemic within the project area. Although unlikely that spruce beetle would extend to the entirety of the stands analyzed in the SBEADMR project area, the current condition and this maximum potential extent of a future diseased condition provided bounds for specialists to analyze the effects of treatment given a) current and b) changed conditions.

With respect to aspen, the changing stand condition does not precipitate such a difference in silvicultural application. Rather, when stands exceed 50% overstory mortality, research indicates that regeneration treatments are less successful. If prior to treatment application, overstory mortality were to exceed that threshold for a given stand analyzed in the SBEADMR project area, instead of modifying the prescription, the Forest Service would likely not attempt implementation. Therefore, the bounds of effects analysis for aspen range between the effects of the No Action alternative and the effects of the action alternatives.

Hazard Tree Treatments

Roadside corridors are identified and analyzed in the FEIS for *potential* hazard tree removal. It is important to note that roadside treatments, unless analyzed as part of a PTA, would be limited to the hazard trees. The roadside corridor is limited as follows:

- Where slopes are >40%: 300 foot buffer from both sides of the road (600 feet total buffer)
- Where slopes are <40%: 150 foot buffer from both sides of the road (the average tree height plus 20%; 300 feet total buffer)

Mechanical Treatments

- Commercial treatments would occur in lands identified as suitable for timber production by the GMUG 1991 Forest Plan Amendment (USDA Forest Service, 1991, Appendix F).
- Non-commercial mechanical treatment methods would include mastication of understory conifer utilizing vertical or horizontal shaft masticators, hand or machine cutting of understory conifer followed by lop and scatter of the slash, hand or machine cutting of understory conifer followed by piling/burning of slash, mastication of aspen as a coppice treatment, and hand or machine cutting of aspen followed by either lop and scatter or piling/burning of the slash as a coppice treatment. Mechanical treatment on slopes greater than 40% would be limited to chainsaws.
- Most tree removal would be accomplished using a variety of contracting methods including commercial timber harvest, service contracts, and stewardship contracts. To a lesser extent, Forest Service work crews or cooperators would be used to thin trees and reduce fuels in areas where contracting is not feasible.
- All commercial mechanical treatments and non-commercial mechanical treatments involving large equipment would occur on slopes less than 40%. For slopes greater than 40%, mechanical treatments would be limited to chainsaws.

- Openings from mechanical treatments in beetle-infected spruce stands or dying aspen stands may exceed 40 acres. Per the 1991 GMUG Amended Forest Plan, the maximum size of openings creating by the application of even-aged silviculture is 40 acres (p. III-43); however, larger openings are permitted in the event of natural catastrophic conditions, such as insect or disease attack. Per the National Forest Management Act, Forest Plan maximum size for openings to be cut in one harvest operation shall not apply to the size of openings harvested as a result of natural catastrophic conditions such as fire, insect and disease attack, or windstorm (16 U.S.C. 1604(g)(3)(F)(iv)).
- Non-commercial mechanical treatments in stands dominated by aspen but having an spruce-fir component mapped as lynx habitat will be limited as follows: within secondary lynx habitat (defined as within 300 meters or 984 feet of primary habitat), removal of spruce-fir in mixed Aspen-spruce stands will not occur. Primary habitats are stands composed of primarily spruce-fir that support habitat elements necessary to support lynx or their prey.
- Within critical habitat for Gunnison sage-grouse, sagebrush will be avoided when conducting non-commercial treatments.
- Precommercial thinning in live multi-story mature or late successional conifer forests will be subject to the Southern Rockies Lynx Amendment, Standard VEG S6 – Exceptions 1, 3 and 4 and VEG S5 Exception 1 and 3.

Prescribed Fire Treatments

- Prescribed fire treatments include broadcast burning and pile burning.
- Broadcast burning would be accomplished with aerial or hand ignitions. Individual burn units would range in size from as small as 50 acres to more than 5,000 acres.
- Most broadcast burning would be applied in areas with an aspen component. Some broadcast burning may be applied in salvaged single-story spruce stands where little/no regeneration is present in order to reduce slash fuel loadings and as a pre-planting site preparation measure.
- Pile burning would be conducted in conjunction with other, mechanical treatments to remove excess fuels created by the treatment. Piles would be either created at landings or constructed throughout treatment units.
- Any treatments that have prescribed fire as a component, whether broadcast or pile burning, will have a Burn Plan developed for them. Burn Plans are required by agency policy and are guided by the FS Manual 5140 as well as the Interagency Prescribed Fire Planning and Implementation Procedures Guide (April 2014). Burn Plans are approved by the Agency Administrator (Forest Supervisor or District Ranger) and contain treatment-specific requirements regarding fuels, topography, and weather conditions under which the burn can be ignited, as well as required fire behavior to meet both the desired objectives and to maintain control of the burn. Burn Plans also contain burn objectives, complexity analysis, size and type of management organization, contingency plans, safety issues and associated mitigations, ignition and holding plans, and smoke management considerations. Additionally, a Smoke Permit from the State of Colorado, Department of Environmental Health, Air Pollution Control Division, would be obtained

for any prescribed burn. The Smoke Permit contains 'permit conditions' under which the burn must be ignited; these include maximum daily acres, wind direction, dispersion index, daily ignition cutoff times, and mitigation measures related to smoke management.

- Within critical habitat for Gunnison sage-grouse, sagebrush will be avoided when conducting prescribed fire.

Access

The existing road network would be used to the maximum extent possible to access the proposed treatments and to remove forest products. For commercial treatments, existing roads would be supplemented by constructing new temporary roads only when necessary; criteria are indicated below. No road construction is proposed for noncommercial treatments. Where necessary for resource protection, existing roads would be reconstructed. Per Forest direction, there would be no increase in open road density.

Road Maintenance

National Forest System roads being used for the project that are in functioning condition would be maintained during the project implementation. Maintenance preserves the function of the road but generally does not include improvements. Maintenance activities generally include: blading; brushing; removal of roadside hazard trees; repair and/or replacement of road surfaces; cleaning, repair, or installation of drainage structures such as culverts, ditches, and dips; dust abatement; removal and installation of closure barriers, and installation or repair of signs. Maintenance activities generally do not disturb ground outside the existing roadway (toe of fill to top of cut) other than removal of material around culvert inlets and cleaning of outlet ditches.

Road Reconstruction

Reconstruction generally includes work to improve and restore roads, or to bring them back up to the original design standard. Improvements would provide for serviceability for project haul vehicles, as well as for proper hydrologic function and stream protection in accordance with applicable Best Management Practices. Actions can include surface improvement; construction of drainage dips, culverts, riprap fills or other drainage or stabilization features with potential disturbance outside the established roadway (toe of fill to top of cut); realignment; and widening of curves as needed for log trucks and chip van passage. Reconstruction also includes the actions included in the Maintenance category, including removal of roadside hazard trees. Reconstruction includes the replacement of unsustainable existing roads with new, designed roads, as well as decommissioning of the prior unsustainable road.

Road Construction

New road construction alignments to access priority treatment areas have been developed. For the Final EIS, the GMUG developed a proposed road system using the following criteria:

- Skid distances from PTAs were greater than ¼ mile to an existing road

Expected actions for road construction include vegetation clearing, excavation and/or embankment, blading and shaping, out-sloping, drainage dips, and water-spreading ditches, and may include importing of armoring and surfacing rock material as needed. More embankment and drainage structures would be utilized when there are adjacent resource concerns (perennial and intermittent stream crossings, high soil erosion hazard, steeper side slopes, etc.). Note that because all new roads in the action alternatives would be decommissioned within 5 years of the closure of the associated SBEADMR timber sale, all road construction analyzed in SBEADMR is temporary.

Road Decommissioning

In response to public comments on the Draft EIS, all roads constructed for SBEADMR will be decommissioned within 5 years of the close of the associated commercial sale. Retention of any SBEADMR road in the National Forest System would require an additional, separate project-level NEPA analysis and decision, and must be informed by a travel analysis process.

Furthermore, existing roads used for project implementation that are *not* identified as National Forest System roads would also be decommissioned within 5 years of the close of the associated commercial sale.

Decommissioning involves a combination of the following rehabilitation tools: removing bridges and culverts, eliminating ditches, out-sloping the roadbed, ripping and scarifying of the road surface to reduce compaction and promote native vegetation, reseeding/replanting native vegetation, removing ruts and berms, effectively blocking the road to normal vehicular traffic where feasible under existing terrain conditions, and building cross ditches and water bars. When bridges and culverts are removed, associated fills shall also be removed to the extent necessary to permit normal maximum flow of water and reconstruction of the floodplain and stream channel as needed.

Right-of-way Acquisition

SBEADMR's identified system of existing haul roads for commercial treatments anticipates a limited number of roads under private jurisdiction would provide more efficient access to a commercial treatment. These account for <1% of anticipated haul routes. These roads would require a Forest Service right-of-way or access agreement to allow for access and haul of forest products. Where appropriate, public easements would be pursued; at a minimum, administrative access would be needed for treatment implementation.

Other Public Roads

Vegetation treatments along and adjacent to county- and State-managed public roads are included in the action alternatives. Where SBEADMR implementation efforts could potentially interfere with traffic or operations of these public roads, coordination with the applicable agency is necessary. This includes construction of new intersections and access aprons that would tie

into existing public roads. Coordination would address signing and traffic control, permitting, alignment, and construction standards necessary for new aprons and intersections, at a minimum.

Connected Actions Related to Roads

Available water and rock material sources within and adjacent to the treatment area would be utilized to support road work. Roads providing access to and from these sites would also be maintained and reconstructed when applicable.

Alternative 2 (Agency Preferred Action)

Size and Geographic Location of Treatments

Alternative 2 analyzes 207,615 acres of discrete disturbance acres. 190,014 of these acres are identified and analyzed as Priority Treatment Areas (PTAs), 17,388 acres as potential hazard tree treatments outside of PTAs, and 213 acres are for potential new road disturbance outside of PTAs. Of the PTA acres, approximately 59% (112,768 acres) are identified as commercially suitable timber acres, and 41% (77,246 acres) are identified for noncommercial treatment. See Table 2, Table 3, and Table 4. Maps of Alternative 2 are located in Appendix G of the Final EIS (Maps G-1 to G-18).

As noted in *Activities Common to All Alternatives*, maximum commercial treatments would total 60,000 acres and maximum noncommercial treatments would total another 60,000 acres, for a total of 120,000 maximum treated acres. Therefore, for commercial treatments, approximately 1 of every 2 acres analyzed for commercial treatment in this alternative would be treated. For noncommercial, approximately 1 of every 1.3 acres analyzed for noncommercial treatment would be treated.

Table 2. Alternative 2: Summary of Analysis Acres

Proposed Activity	**Total Acres**
Hazard Trees Outside PTAs	17,388
New Roads Outside PTAs	213
Priority Treatment Areas	190,014
Commercial	*112,768*
Noncommercial	*77,246*
Grand Total Analysis Acres	**207,615**

Table 3. Alternative 2: Summary of Analysis Acres by Geographic Area & Activity Type.

The Adapted Future Action -All Salvage treatment type is identified in order to provide bounds for analysis. Proposed broad treatment types are based on the current level of mortalities in a stand, but as mortality from spruce beetle increases, more treatments would correspondingly shift to salvage.

	Outside PTAs		*Commercial PTA & Treatment Type*					*Noncommercial PTA & Tx Type*			
Geographic Area	**Hazard Trees**	**New Roads**	**Combination**	**Resiliency**	**Salvage**	**Adapted Future Action -All Salvage**	**Total Commercial PTA**	**Burn & Mechanical**	**Mechanical Only**	**Total Noncomm PTA**	**TOTALS by GA**
Grand Mesa	1,075	19	8,808	6,163	486	*15,457*	**15,457**	14,548	830	**15,378**	**31,929**
Gunnison Basin North	3,696	49	6,897	6,663	1,825	*15,385*	**15,385**	21,560	0	**21,560**	**40,691**
Gunnison Basin South	4,794	44	11,334	4,419	12,061	*27,815*	**27,815**	7,954	0	**7,954**	**40,607**
North Fork Valley	2,258	25	3,356	5,025	544	*8,925*	**8,925**	7,176	864	**8,039**	**19,247**
San Juans	2,023	42	7,773	2,595	1,830	*12,198*	**12,198**	348	0	**348**	**14,611**
Uncompahgre Plateau	3,542	34	14,997	17,634	357	*32,988*	**32,988**	23,966	0	**23,966**	**60,531**
TREATMENT TOTALS	**17,388**	**213**	**53,166**	**42,499**	**17,103**	***112,768***	**112,768**	**75,552**	**1,694**	**77,246**	**207,615**

Table 4. Alternative 2: Cover Type by PTA Treatment Category

Treatment Category	Cover Type	Acres	% of Row Total
Commercial		**112,768**	**59%**
	Aspen	4,950	4%
	Aspen Spruce Mix	37,038	33%
	*Other**	*2,660*	*2%*
	Spruce	68,121	60%
Noncommercial		**77,246**	**41%**
	Aspen	69,114	89%
	Aspen Spruce Mix	8,132	11%
Grand Total PTA Acres		**190,014**	**100%**

**Other* cover types within the commercial Priority Treatment Areas would not be treated.

** In addition to the vegetation cover types targeted for noncommercial treatment listed here (aspen and aspen-spruce mix), other cover types in the noncommercial Priority Treatment Areas could be incidentally treated in order to facilitate implementation of prescribed burns in the targets. Approximately 6,257 acres are identified in detail and analyzed for treatment in the Fuels section, Chapter 3.

Silvicultural Prescriptions

The full suite of identified silvicultural prescriptions are included in Alternative 2. See Appendix A of the Final EIS.

Access

In order to access proposed commercial treatments and remove forest products, Alternative 2 includes the following maximum roadwork. These represent maximum anticipated miles that may be constructed and maintained under this alternative, and are based on the maximum acreage analyzed for commercial treatment in Alternative 2. This roadwork would be conducted in accordance with the descriptions provided above (See *Activities Common to All Action Alternatives / Access).*

Table5. Alternative 2 Maximum Road Treatments

	No Action	Alt 2
Road construction (miles)	0	178
Road reconstruction (miles)	0	538
*Existing system roads**	*0*	*356*
Existing non-system roads	*0*	*182*

Road decommissioning	0	360
Road maintenance (miles)*	0	714

**Assumed that 1/3 of system roads used for hauling would be reconstructed prior to use and the remaining 2/3 would simply be maintained.*

Alternative 3 (WUI Alternative)

Alternative 3 shifts the geographic extent of treatments exclusively to 1) the wildland urban interface (WUI) and 2) outside the WUI, proximal to additional human infrastructure.

All treatment types and methods would remain the same as in Alternative 2, but would be limited to the identified geographic extent.

Size and Geographic Location of Treatments

Alternative 3 analyzes 127,023 acres of discrete disturbance acres. 102,159 of these acres are identified and analyzed as Priority Treatment Areas (PTAs), 24,695 acres as potential hazard tree treatments outside of PTAs, and 169 acres are for potential new road disturbance outside of PTAs. Of the PTA acres, approximately 45% (45,967) are identified as commercially suitable timber acres, and 55% (56,192) are identified for noncommercial treatment. See Table 6, Table 7, and Table 8. Both noncommercial and commercial PTAs in Alternative 3 total less than 60,000 acres, so treatments of hazard trees may or may not make up the difference. Depending on the extent of hazard trees within the identified roadside corridors over the life of the project, fewer total acres may be treated in Alternative 3, ranging from ~46,000-60,000 acres commercially to 56,192-60,000 acres non-commercially. Maps of Alternative 3 are located in Appendix G of the Final EIS (Maps G-18 to G-36) of the Final EIS.

As noted in *Activities Common to All Alternatives*, maximum commercial treatments would total 60,000 acres and maximum noncommercial treatments would total another 60,000 acres, for a total of 120,000 maximum treated acres.

Table 6. Alternative 3: Summary of Analysis Acres

Proposed Activity	**Total Acres**
Hazard Trees Outside PTAs	24,695
New Roads Outside PTAs	169
Priority Treatment Areas	102,159
Commercial	*45,967*
Noncommercial	*56,192*
Grand Total Analysis Acres	**127,023**

Table 7. Alternative 3: Summary of Analysis Acres by Geographic Area & Activity Type.

The Adapted Future Action -All Salvage treatment type is identified in order to provide bounds for analysis. Proposed broad treatment types are based on the current level of mortalities in a stand, but as mortality from spruce beetle increases, more treatments would correspondingly shift to salvage.

			Commercial PTA & Treatment Type					*Noncommercial PTA & Tx Type*			
Geographic Area	**Hazard Trees Outside PTAs**	**New Roads Outside PTAs**	**Combination**	**Resiliency**	**Salvage**	**Adapted Future Action - All Salvage**	**Total Commercial PTA**	**Burn & Mechanical**	**Mechanical Only**	**Total Noncomm PTA**	**TOTALS by GA**
Grand Mesa	1,516	28	5,283	3,605	376	*9,264*	**9,264**	11,809	830	**12,639**	**23,448**
Gunnison Basin North	5,241	45	1,986	2,245	732	*4,963*	**4,963**	15,173	0	**15,173**	**25,421**
Gunnison Basin South	7,413	20	1,637	999	1,259	*3,896*	**3,896**	3,049	0	**3,049**	**14,378**
North Fork Valley	2,817	20	1,761	4,293	56	*6,111*	**6,111**	5,117	841	**5,958**	**14,906**
San Juans	2,516	22	3,137	1,076	652	*4,864*	**4,864**	348	0	**348**	**7,751**
Uncompahgre Plateau	5,192	34	8,766	7,886	218	*16,869*	**16,869**	19,025	0	**19,025**	**41,120**
Treatment Totals	**24,695**	**169**	**22,571**	**20,103**	**3,293**	***45,967***	**45,967**	**54,521**	**1,671**	**56,192**	**127,023**

Table 8. Alternative 3: Cover Type by PTA Treatment Category

Treatment Category	Cover Type	Total Acres	% of Parent Row
Commercial		**45,967**	**45%**
	Aspen	2,864	6%
	Aspen-Spruce Mix	18,008	39%
	Other*	1,005	2%
	Spruce	24,089	52%
Noncommercial**		**56,192**	**55%**
	Aspen	50,804	90%
	Aspen-Spruce Mix	5,388	10%
Grand Total PTA Acres		**102,159**	**100%**

**Other* cover types within the commercial Priority Treatment Areas would not be treated.

**In addition to the vegetation cover types targeted for noncommercial treatment listed here (aspen and aspen-spruce mix); other cover types in the noncommercial Priority Treatment Areas could be incidentally treated in order to facilitate implementation of prescribed burns in the targets. Approximately 4,750 acres of these "other" cover type acres are identified in detail and analyzed for treatment in the Fuels section, Chapter 3.

Access

In order to access proposed commercial treatments and remove forest products, Alternative 3 includes the following maximum roadwork. These represent maximum anticipated miles that may be constructed and maintained under this alternative, and are based on the maximum acreage analyzed for commercial treatment in Alternative 3. This roadwork would be conducted in accordance with the descriptions provided above (See *Activities Common to All Action Alternatives / Access).*

Table 9. Alternative 3 Maximum Road Treatments

	No Action	Alt 3
Road construction (miles)	0	80
Road reconstruction (miles)	0	336
*Existing system roads**	*0*	*248*
Existing non-system roads	*0*	*88*
Road decommissioning	0	168
Road maintenance (miles)*	0	497

**Assumed that 1/3 of system roads used for hauling would be reconstructed prior to use and the remaining 2/3 would simply be maintained.*

Summary of Alternatives

Table 10 provides a summary of the areas analyzed for both action alternatives and significant features of each alternative. The total area is represented in a variety of different subset breakouts.

Table 10. Summary of Alternatives.

Description	Alternative 1 No Action	Alternative 2 Agency Preferred Action	Alternative 3 WUI Action
Priority Treatment Areas (PTAs)			
Total PTA [1]	**0**	**190,014 acres**	**102,159 acres**
Commercial PTAs	0	112,768 acres (59% of total)	45,967 acres (45% of total)
Noncommercial PTAs	0	77,246 acres (41% of total)	56,192 acres (55% of total)
Priority Treatment Areas by species			
Commercial [2]			
Aspen	0	4,950 (4% of commercial PTAs)	2,864 (6% of commercial PTAs)
Spruce	0	68,121 (60% of commercial PTAs)	24,089 (52% of commercial PTAs)
Aspen-Spruce Mix	0	37,038 (33% of commercial PTAs)	18,008 (39% of commercial PTAs)
Other *(in mapped PTAs, but would not be treated)*		2,660 (2% of commercial PTAs)	1,005 (2% of commercial PTAs)

Description	Alternative 1 No Action	Alternative 2 Agency Preferred Action	Alternative 3 WUI Action
Noncommercial			
Aspen	0	69,114 (89% of noncommercial PTAs)	50,804 (90% of noncommercial PTAs)
Aspen-Spruce Mix	0	8,132 (11% of noncommercial PTAs)	5,388 (10% of noncommercial PTAs)
Geographic limitations that resulted in the PTAs	N/A	Anywhere spruce, aspen, and spruce/aspen mix vegetation types occur on the GMUG outside of Colorado Roadless, Wilderness, and other special designations. These 718,000 acres then further refined via prioritization exercise, as detailed in Chapter 2 and Appendix F.	Spruce, aspen, and spruce/aspen mix treatments would occur under the same parameters as Alternative 2 except they would only occur within the Wildland Urban Interface areas as defined in this FEIS:1 mile buffer from communities, developed sites, and administrative facilities; and within ski area boundaries.
Treatments Types Available			
Public Safety Treatments (Y/N)			
Activities for Public Safety: Hazard trees – Dead/diseased spruce and aspen within 150 feet of communication sites; dispersed recreation sites; developed campgrounds and recreation sites; electrical power and above-ground telephone line corridors; and roads open to the public. Incidental species other than spruce and aspen may need to be removed, if pose same hazard. Buffer would increase to 300feet on uphill side of steep slopes. PTAs identified within WUI as defined in the FEIS	No	Yes	Yes
PTAs within WUI	0	102,159	102,159
Additional Hazard Tree Acres (outside PTAs)	0	17,388	24,695

Description	Alternative 1 No Action	Alternative 2 Agency Preferred Action	Alternative 3 WUI Action
Mechanical Treatments (Y/N)			
Mechanical Treatments: •Include contract commercial timber harvest (salvage), service contracts, stewardship contracts or agreements and to a lesser extent, Forest Service work crews or cooperators •Near communities and infrastructure, heavy fuels created by treatment would be masticated or piled and burned •Commercial mechanical treatments and non-commercial mechanical treatments involving large equipment on slopes < 40% •Non-commercial mechanical with chainsaws on slopes < or >40% •Cut and chunk, chipping, and hand-cut pile-burn in remote areas •Coppice cutting (in aspen)	No	Yes	Yes
Fire Treatments (Y/N)			
•Prescribed fire for aspen regeneration purposes •Disposal of activity fuels •Pile burning as needed to reduce slash.	No	Yes	Yes
Spruce Prescriptions Note: More detailed silvicultural prescriptions are in *Appendix A*.			
Activities in spruce	None	Recovery (salvage) prescription for >90% overstory mortality Stands with more live component treated for resiliency: - Resiliency prescription for stands with <40% overstory mortality - Recovery and resiliency prescription for >40% <90% overstory mortality	Same as Alt. 2.

Description	Alternative 1 No Action	Alternative 2 Agency Preferred Action	Alternative 3 WUI Action
Activities in aspen with spruce-fir understory		Mature aspen stand w/ < 50% SAD: Removal of live aspen to trigger sprouting (coppice). Young healthy aspen stands w/ < 50% SAD: selective removal of spruce-fir to set back successional process in the stand. Prescribed fire as needed to encourage aspen regeneration. Pile burn as needed to reduce fuel loading.	Same as Alt. 2.
Aspen Prescriptions Note: More detailed silvicultural prescriptions are in *Appendix A*.			
Activities in pure aspen	None	Coppice cutting and prescribed fire to promote regeneration in aspen with <50% overstory mortality, on opportunistic basis in aspen with >50% overstory mortality	Same as Alt. 2.
Activities in mixed conifer with aspen component[6]	None	Selective removal of spruce-fir and/or other conifer species to allow additional aspen. Broadcast burn in and around mixed stands with aspen to encourage aspen regeneration. Pile burn as needed to reduce fuel loading.	Same as Alt. 2.
Access			
Road reconstruction, (miles) *Includes both existing system and non-system roads*	0	538	336
Road construction (miles)	0	178	80
Decommissioned roads (miles)	0	*(360)*	*(168)*
Road maintenance (miles)	0	714	497

[1]Note that due to inaccuracies of vegetation type mapping, minor amounts of treatment could occur outside the actual GIS polygons used in analysis if the vegetation type, stand conditions and management area are such that treatment is warranted by the matrix. Acres rounded to nearest 1,000. Public safety areas, defined as road corridors and the wildland urban interface (WUI) are common to both action alternatives.

[2]As noted throughout this FEIS, commercial treatments would only occur on suitable timber lands as defined by the 1991 Forest Plan Amendment (USDA Forest Service, 1991, Appendix F).

Design Features Applied to Avoid or Minimize Effects to Wildlife

Design criteria for all resources applicable to all action alternatives can be found in the Final EIS in Appendix B. Table 11 below lists wildlife design criteria for all action alternatives for the SBEADMR project.

Wildlife-Specific Project Design Features

A full list of all design features by resource area and the source/citations can be found in Appendix C of this document. Appendix D (of this report) describes the avoidance or minimizing impact mechanism that the wildlife design features address. Table 11 lists wildlife design features for all action alternatives.

Table 11. Wildlife-Specific Design Features for all Action Alternatives

Threatened, endangered, proposed, sensitive or MIS species	Number	Design Feature
Canada lynx (threatened). Sensitive species and MIS including goshawk, boreal owl, olive-sided flycatcher, pygmy shrew, and American marten.	WFRP-1	All applicable management Objectives, Standards and Guidelines contained in the Southern Rockies Lynx Amendment will be applied during project planning, analysis and implementation.
	WFRP-12	Areas supporting live advanced regeneration with >35% Dense Horizontal Cover in blocks greater than 0.3 acres will be avoided to the extent possible during layout [and during harvest operations], while allowing feasible operations.
	WFRP - 18	To maintain the amount and distribution of lynx foraging habitat over time capable of supporting lynx at the LAU scale, manage so that no more than 30% of the lynx habitat in an LAU is in an early stand initiation structural stage or has been silviculturally treated to remove horizontal cover (i.e., does not provide winter snowshoe hare habitat). Emphasize sustaining snowshoe hare habitat in an LAU. If more than 30% of the lynx habitat in an LAU is in early stand initiation structural stage or has been silviculturally treated to remove horizontal cover (e.g., clear-cuts, seed tree harvest, pre-commercial thinning, or understory removal), no further increase as a result of vegetation management treatments should occur on federal lands. Acres affected by lynx analysis unit through 2015 are available in the treatment analysis file. As management occur in the affected LAU over the life of the treatment, acres affected will be tracked by the District wildlife biologist and Forest wildlife program lead to ensure consistency with this conservation measure.

Threatened, endangered, proposed, sensitive or MIS species	Number	Design Feature
	WFRP-17	Following basic conservation biology principles, habitat connectivity will be maintained at the landscape scale (Lynx Analysis Unit scale for lynx) through various methods depending on treatment type, location, site-specific conditions and overall condition of each Lynx Analysis Unit. Methods may include a combination of variable retention regeneration harvest methods through resiliency treatment types; tree retention areas of various sizes and shapes to retain snag groups and protect live understory trees across the landscape, with emphasis on multi-storied forest stands and areas typically used by wildlife as travel corridors (ridges, saddles, stream corridors); and maintaining areas of high quality snowshoe hare habitat as determined from dense horizontal cover field surveys using an established scientific protocol (cover board protocol) In terms of habitat connectivity considerations and to meet Southern Rockies Lynx Amendment direction, there will be a lot of focus on protecting areas with high quality dense horizontal cover in multi-storied stands. On a timber sale by timber sale basis, coordination will occur between the District wildlife biologist and the timber staff to determine the appropriate method for accomplishing habitat connectivity goals, including determining the appropriate size, shape, and location of tree retention areas.
	WFRP-11	Skid trails and landings will be located to minimize impacts to advanced regeneration. Skid trails will be placed at least 100 feet apart, except where they converge at landings.
	WFRP-19	American (Pine) Marten – Research has shown that martens avoid openings created from vegetation management activities that completely remove all trees (structural stand initiation stage) if the openings are larger than 300 feet in width. In areas identified as multi-storied spruce-fir, openings created should be less than 300 feet in width unless suitable marten habitat is maintained within cutting units through snag, advanced regeneration, and course woody debris retention as described in the above design features. Cutting units of this size will only occur when salvage prescription are applied and will be subject to WFRP-12. **Exception**: areas where public safety is a concern (road corridors, around structures, etc.). Commercial treatments will target dead trees larger than eight inches in diameter so some residual cover will remain within cutting units. Irregular-shaped harvest units are desirable.
	WFRP-20	Within secondary habitat for lynx (300 foot buffer from primary habitat) retain spruce and fir in aspen-spruce mix stands. Primary habitat is defined as having a dominance of spruce-fir cover type. Most of the secondary habitat includes either pure aspen or aspen-spruce mixed stands.

Threatened, endangered, proposed, sensitive or MIS species	Number	Design Feature
Canada lynx, big game, and other wildlife species	WFRP-5	In forested areas where salvage, resiliency, combination, prescribed burn and mechanical treatments are implemented, strive to maintain forested cover on 60% or more of the perimeter of all natural and created openings, and along at least 60% of each NFS Road (level 5 and below) that has high levels of human use during the time deer and elk would be expected to inhabit an area. Roads with restricted use could provide for less cover. Except where natural openings or parks exist along roads and when applying hazard tree removal activities along roads to meet public safety goals, gaps along roads should not exceed ¼ mile. Cover should be well-distributed across the landscape. Minimum sizes for hiding and thermal cover patches are 2 -5 acres for mule deer, and 30 – 60 acres for elk. The intent is to maintain or improve habitat diversity and make or keep the area in a condition where deer and elk can effectively use the area by managing the vegetation and human activity. This design feature provides an opportunity to implement the proposed commercial and noncommercial activities in a way that accomplishes these wildlife habitat objectives while also meeting the purpose and need of the project. District wildlife, timber and fire programs will coordinate closely during the planning and design phase of projects to accomplish these objectives.
Gunnison sage-grouse (threatened)	WFRP-16	Gunnison sage-grouse – Portions of haul routes may occur in occupied habitat in few areas. Where use of haul routes have the potential to impact Gunnison sage-grouse as determined by the District wildlife biologist, timing restrictions should be applied that prohibit the use of haul routes that occur within 0.6 mi of active leks (breeding sites) from March 15 – May 15. Haul routes that are open to the public year-round would be excluded from this design feature (this applies to main roads such as State and U.S. highways and certain county roads). Noncommercial treatments at lower elevations have the potential to incidentally affect sagebrush habitat. Avoid areas of sagebrush habitat. The District wildlife biologist will be responsible for coordinating with Colorado Parks and Wildlife to verify annual lek status and in coordinating with timber and fire staff on locations of sage-grouse habitat avoidance areas.
	WFRP-21	When planning non-commercial treatments in critical habitat for Gunnison sage grouse, avoid direct treatment to sagebrush. Any treatment in designated critical habitat will be planned in coordination with the District Biologist.

Threatened, endangered, proposed, sensitive or MIS species	Number	Design Feature
Cavity nesters, small mammals, marten, lynx, raptors, olive-sided flycatcher	WFRP-2	At a minimum, in spruce-fir forest types maintain 90 to 225 snags per 100 acres, 10 inches in diameter at breast height (dbh) or greater (where biologically feasible). In aspen forest types, maintain 120 – 180 snags per 100 acres, 8 inches dbh or greater (where biologically feasible). Snags would be maintained away from structures, roads and trails so that they do not create safety hazards to the public. Trees to retain include large live trees with broken or dead tops, and other trees showing wildlife signs (dens, nests, cavities, squirrel middens, woodpecker activity) within and adjacent to harvest units to provide for perching, foraging, roosting, and nesting sites for wildlife. To compensate for the lack of snags along road corridors due to hazard tree removal for safety, leave a greater density of wildlife trees in areas away from roads and landings. Snags within 500 feet of water (creeks, ponds, wet meadows, seeps, and springs), meadows/parks/forest openings, and ridge tops are particularly valuable to wildlife. Where possible, groups of snags in close proximity to each other or associated with green trees will be retained. Retention of snag groups in strategically placed areas that consider prevailing winds will reduce wind-throw. Where possible, utilize natural sinuosity or drainages for linking groups. Leave snags with a variety of heights, shapes, and decay condition. Generally, taller and larger diameter snags provide better habitat for more species. Leave snags of all species type. Protect standing wildlife trees from damage during site preparation and post-sale activities.
Lynx, marten, small mammals, amphibians, and other species	WFRP-3	Where feasible, maintain a minimum of 10-20 tons per acre of coarse woody debris within harvest units. This will help maintain soil moisture at ground level for mosses, fungi, and lichens and to encourage faster re-colonization of harvest units by small mammals and other prey species. Retain some small slash piles to provide habitat for small mammals. Where possible in regeneration units, create piles of logs, stumps, or other woody debris to minimize the effects of larger openings and to provide connectivity to adjacent stands for lynx, marten, and other species that may generally avoid open areas and utilize concentrations of down wood for foraging or denning.
	WFRP-4	Maintain large diameter downed logs in various stages of decomposition within harvest units (50 linear feet/acre of 10 inches diameter or larger at the large end of lodgepole pine and aspen logs and/or 12 inches diameter or larger for Engelmann spruce, subalpine fir and Douglas fir logs).
Northern Goshawk (other sensitive and Management Indicator Species)	WFRP-7	Northern goshawk - No activities will be allowed within ½ mile of active nests from March 1 to August 31. The timing restriction buffer could be reduced to ¼ mile if topographic features and/or adequate screening cover are present that would protect the nest site from disturbance. No harvest activities will be allowed within a 30-acre buffer of nest sites. Outside of a 30-acre area around goshawk nest sites, timing restrictions are not needed for treatment layout, marking, and any other activities that are non-disturbing (i.e., activities not involving the use of heavy equipment or chainsaws). Timing restrictions will only apply to active nests, as confirmed by the GMUG National Forests' wildlife biologist. The District wildlife biologist will keep the timber and fire staff informed on nest status and locations.
	WFRP-8	Northern goshawk – provide or leave 20% of pole or mature tree stands adjacent to nesting sites with at least 150 square feet of basal area. Provide or leave at least one class 1 log adjacent to nest sites. The District wildlife biologist will be responsible for coordinating with timber and fire staff on nest locations and assessing vegetation conditions adjacent to nest sites.

Threatened, endangered, proposed, sensitive or MIS species	Number	Design Feature
Other raptors potentially occurring on the GMUG.	WFRP-9	On-going surveys for raptors would be conducted to determine locations of individuals or populations of these species and allow for the implementation of protection measures using the appropriate buffer or timing restriction, consistent with GMUG NF Forest Plan direction and as recommended by the Colorado Parks and Wildlife Raptor Buffer and Timing Restriction Recommendations.
MIS and various sensitive species, Canada lynx, snowshoe hare	WFRP-10	Retain live trees in salvage units, except for trees that need to be removed for operational/safety or silvicultural purposes. Operational/safety or silvicultural purposes include the need to remove live trees if necessary to access dead trees for salvage or to address safety concerns.
	WFRP-23	In LAU with extensive mortality of mid-late and late seral spruce (Habitat Structural Stages 4A, 4B and 4C), retain these live stands to the greatest extent practicable during project planning.
Multiple species	WFRP-13	Landings and main skid trails should be evaluated by a soil scientist/specialist to determine if detrimental soil compaction has occurred. Based on review by a specialist, when detrimental compaction is found, subsoil ripping may be applied to reduce soil impacts when a site prep contract is necessary for an area. When a site prep contract is necessary, this provides the opportunity to rip skid trails and landings in the area and potentially in nearby adjacent areas. This would provide for a more suitable seedbed for future regeneration, thus preventing permanent impacts of skid trails that when left in a compacted state, often do not regenerate as well as adjacent un-compacted areas. Importantly, all operations will conform to the direction in Chapter 10 of the Water Conservation Practices Handbook including managing treatments to limit the sum of severely burned soil and detrimentally compacted, eroded, and displaced soil to no more than 15% of any activity area.
All TES species	WFRP - 14	Surveys for threatened, endangered, and sensitive (TES) species will occur prior to design of a treatment. However, since it may take several years to fully implement a treatment, some level of TES re-survey will occur on an annual basis. If TES species are confirmed present, applicable design features identified in this table will be applied to ensure consistency with the Forest Plan, Endangered Species Act, and Forest Service Sensitive Species Policy. Once a project is in the implementation phase, if TES species are confirmed present during operations the District wildlife biologist will be consulted and the appropriate standards for the Forest Plan will be applied (timing restrictions, buffer of nest sites, identify no cut area around nest sites, etc.). For example, if a new goshawk nest is found during operations, operations will stop; the District biologist will be informed and will evaluate the situation to determine if adverse impacts are occurring. This may include establishing an avoidance area around the occupied habitat or nest site consistent with Forest Plan direction and best available science to avoid impacts that could lead to nest abandonment and/or mortality.

Threatened, endangered, proposed, sensitive or MIS species	Number	Design Feature
Elk, deer, pronghorn, moose, and other wildlife species	WFRP-15	Winter logging is encouraged to limit direct disturbance to the fewest number of wildlife species as possible. When possible, avoid treatment activities in areas where big game (elk, deer, pronghorn and moose) are known to occur. When big-game winter range is bisected by proposed haul routes and there are concentrations of animals along these routes minimize stress to wintering animals to the extent practicable by: A. Re-routing along another acceptable route. B. From December 1 to April 15, restrict haul times to between 9 am and 4 pm, unless otherwise agreed to in writing by the Forest Service. The district biologist will coordinate with Colorado Parks and Wildlife to asses big game use and identify areas where animals concentrate during winter, and assess if there is a need to implement conservation measures. This would be a coordinated effort with the GMUG, Colorado Parks and Wildlife, and the timber purchaser. When the need arises to protect concentrations of wintering big game, the District wildlife biologist will be responsible for providing the timber staff with maps of these areas.
	WFRP-6	Provide hiding cover within 1,000 feet of any known elk calving areas. The District wildlife biologist will be responsible for coordinating with Colorado Parks and Wildlife to identify calving areas and informing timber and fire staff on locations. When calving areas are identified, a 1,000 foot buffer will be applied and existing vegetation conditions within the buffer will be assessed by the District biologist to determine cover needs, identify areas to avoid with treatments, or coordinate with timber and fire staff to determine how treatments could be designed to maintain or enhance cover.
Purple Martin	WFRP-22	When planning treatments in mature aspen, complete inventories for purple martin and avoid these areas if birds are detected. In Colorado, habitat preference seems very specific: edges of mature aspen stands, usually near a stream, spring of pond.
Amphibians	WFRP-24	To minimize spread of Amphibian Chytrid Fungus, at least one member of the Aquatics Team will participate in the planning and implementation of project-level operations. See also IW-2 for equipment washing requirements.
	WFRP-25	In areas where Boreal Toad is known to exist the timing of ground based activities may be limited by the season. Boreal Toads forage up to 1.6 miles from breeding sites (pond) between July and late October. Ground based operations of commercial or non-commercial equipment will be limited in these areas to when there is at least 4 inches of frozen soil or over snow to extent practicable. Under current known toad distribution, WFRP-25 would only apply to the Cement Creek commercial PTA.
	WFRP-26	Where non-commercial fuel reduction treatments overlap the occurrence of Boreal Toad there will be no mechanical operations (i.e. mastication, etc.). In these areas pile burning will be used to reduce fuels while concurrently minimizing ground disturbance, the possibility of indirect toad mortality and reduction or loss of hibernaculum habitat. Under current known toad distribution, WFRP-25 would only apply to the Buzzard Creek non- commercial PTA.

Action Area

The action area is not limited to the project footprint, but rather encompasses the full geographic area potentially affected by the proposed actions, including direct, indirect and cumulative activities. The action area includes all areas potentially affected by visual and audible disturbance created by the project activities, as well as potential terrestrial and aquatic habitat

impacts. The action area serves to establish baseline conditions from which to evaluate potential effects from the project.

The action area used for this analysis for sensitive species is the SBEADMR Priority treatment areas (PTAs), which are the maximum extent of geographic area analyzed for potential treatments. While the PTA description above describes the PTA ranging in size from approximately 127,000 – 208,000 acres, the action area for sensitive species ranges from 176,663 – 275,423 acres. This is because vegetation types not targeted for treatments within PTAs were included in the analysis for sensitive and MIS to account for effects that extend beyond the footprint of disturbance. Where appropriate, the analysis is further assessed by Geographic Area (described below in Existing Conditions); or at the GMUG Forest-level for management indicator species.

EXISTING CONDITION

The existing condition in the action area has been affected by past and ongoing activities and natural processes, including forestry activities such as timber harvests, grazing, various recreational activities, wildlife use, and wildfire and associated suppression activities. Forested stands have been affected by bark beetle infestation resulting in mortality of trees that can be seen across the landscape.

The SBEADMR project will primarily treat Engelmann spruce-subalpine fir (*Picea engelmannii-Abies bifolia*) and aspen (*Populus tremuloides*) vegetation types. Both spruce-fir and aspen occur as or within a matrix of other vegetation types. Most spruce-fir stands in the project area range from 100 to 200+ year old and aspen range from 80 to 120 years old. Spruce-fir stands provide high quality denning, foraging and dispersal habitat for Canada lynx. Other species that utilize spruce-fir are boreal owl, olive-sided flycatcher, American three-toed woodpecker, hairy woodpecker, northern goshawk and a variety of Neotropical migratory and resident songbirds and woodpeckers, and mammal species such as Rocky Mountain elk, American marten and pygmy shrews. Treatments in the planning area include opportunities to promote/maintain multi-storied, mature stand structures for denning and dispersal habitat that exist within the spruce-fir in the project area.

Aspen is also a common constituent in the primary vegetation type of the subalpine zone in the Southern Rocky Mountains, and can also form homogeneous stands. Aspen can also occur in the lower-elevation montane zone (Johnston and others 2001). Some of the aspen stands are those in which conifers are unlikely to succeed them. These stands are mature and are near the end of the physiological life span. Due to past heavy browse pressure on aspen sprouts by ungulates and livestock in some areas, the successful establishment of new aspen stands is reduced. The species considered in this document are specialists for aspen habitats during one or more life history periods. Aspen forests support high biodiversity, providing habitat for a variety of mammal and birds species including but not limited to deer, elk, small mammals (e.g. chipmunks, gophers, squirrels and voles), red-naped sapsucker, northern flicker, downy woodpecker, black-capped chickadee, house wren, warbling vireo, yellow-rumped warbler, dark eyed junco and northern goshawk.

The spruce-fir zone, or subalpine zone, is the highest forested zone on the GMUG NF, occurring from around 9,500 ft (2,900 m) elevation to the upper treeline, often called timberline. Upper treeline occurs around 11,500 – 12,000 ft (3,500 – 3,650 m), somewhat higher in the south part of the forests and on north-facing slopes (Johnston and others 2001). The subalpine zone is dominated by large, continuous stands of Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies bifolia*); sometimes lodgepole pine (*Pinus contorta*) or aspen (*Populus tremuloides*) will be dominant, but slowly seral to fir and spruce. There are openings and parks within this zone, a few large parks, with big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) or fescue grasses (*Festuca thurberi* or *F. idahoensis*). Riparian areas in relatively undisturbed condition are dominated by one of the smaller willows (*Salix planifolia, S. wolfii, S. brachycarpa*, etc.) and sedges (*Carex aquatilis* etc.). Most of the fens are in the subalpine zone (Johnston and others 2012).

The subalpine zone for the last few decades has seen a great deal of tree mortality. Various root and butt-rot diseases have affected subalpine fir, and beetles, budworms, and dwarf-mistletoe the Engelmann spruce. Almost all stands in this zone are at least partially dead; a trail through the subalpine is often blocked by fallen trees, even a few days after a trail crew cleared it. Then in the last decade, spruce bark beetle populations increased dramatically, killing whole stands of Engelmann spruce within a few years. This spruce beetle epidemic is the major focus of this project.

The montane zone on the GMUG NF occurs between about 8,700 ft (2,650 m) and 10,500 ft (3,200 m). The montane zone is partially forested, with the forested portion dominated by lodgepole pine, aspen, ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*). There are occasional stands of blue spruce (*Picea pungens*). The rest of the montane zone is dominated by big sagebrush, Gambel oak (*Quercus gambelii*), and various other shrublands and grasslands. Riparian areas in relatively undisturbed condition have narrowleaf cottonwood (*Populus angustifolia*), blue spruce, various tall willows (*Salix monticola, S. geyeriana, S. drummondiana*, etc.) and sedges (*Carex utriculata*, etc.).

Many aspen stands in the montane zone experienced significant mortality from sudden aspen decline after a deep drought early in this century (Worrall and others 2008-2010-2013), especially aspen stands that had not been treated previously. Aspen decline is projected to continue in tandem with climate change, especially following future droughts (Worrall 2010). The severe epidemic by mountain pine beetle in lodgepole pine that decimated northern Colorado forests during that same period has yet to be seen on these national forests, although mountain pine beetle is present here, mostly in endemic quantities.

The action area can be further described and characterized by specific Geographic Areas. Geographic Areas are described based on features that may be unique to or differ among specific areas, based on elevation, vegetation types, human influences, or other factors. The following describes each Geographic Area for the GMUG NF:

Grand Mesa

Vegetation

Aspen and spruce-fir cover types each currently occupy 26 percent of the Grand Mesa Geographic Area. Aspen is also present in 31 percent of the spruce-fir cover type, making aspen the most common tree species on the Geographic Area.

The large extent of aspen is the result of large scale fires in the late 1800s (Sudworth 1900), that affected most of the Grand Mesa Geographic Area. As a result, the majority of this geographic area is currently in mid seral conditions.

Approximately 84 percent of the forest and woodland cover types are in the mature size class.

The majority of the current forest and woodland vegetation conditions – 91 percent - have dense canopy closures (> 40 percent canopy closure).

There is very little early seral condition in any cover type on the Grand Mesa Geographic Area.

When comparing the compositions of current vegetation cover types to PNV types), there is very close comparison, a further indication that current cover types are predominantly in mature conditions.

The trend across all vegetation cover types on the Grand Mesa is to continue successional progress predominantly with the absence of either natural or human-caused disturbances. Structural and compositional conditions in each cover type will continue to progress along successional timelines. A shift from aspen dominated forests to conifer dominated forests is also occurring as a result of successional changes.

Fire and Fuels

The Grand Mesa Geographic Area, and particularly the spruce-fir and aspen cover types, have very little fire occurrence. Much of this Geographic Area is high elevation, receives significant winter moisture, has cool summer temperatures, and stays moist throughout most fire seasons. Additionally, as mentioned previously, these vegetation types are largely in a mid-seral condition and may not currently have the fuel loading, or fuel structure, to support significant fire behavior or growth.

Though current conditions may not be conducive to fire occurrence and growth, many of the spruce-fir stands are maturing, developing closed canopies, exhibiting increased mortality, and are beginning to develop surface fuel loads, as well as understory ladder fuels. The spruce beetle epidemic on the Grand Mesa is currently mild but will have an impact on fuel complexes as additional trees die, fall to the forest floor, and new vegetation grows into the resulting openings. As the natural maturing process, and the impact of beetle kill, continues, the spruce-fir stands will become more flammable on the Grand Mesa.

Most aspen stands currently have limited potential to carry fire, though they are aging and some trees, and even whole stands, are beginning to die and fall, and there is conifer encroachment in many of the aspen understories.

The impacts of climate change to both spruce-fir and aspen could more quickly contribute dying trees, surface fuels, and drying conditions, further accelerating the potential of these vegetation types to support fire.

There is significant Wildland Urban Interface in the Ward Lake area, near Powderhorn Ski Area, as well as in other scattered areas within and adjacent to the spruce-fir and aspen vegetation types on the Grand Mesa. There are also major powerline corridors that cross the Grand Mesa.

There is very little early seral condition on the Grand Mesa, primarily as a result of the climatic conditions in the area and the 130+ years since past major disturbances. As many stands mature and become more susceptible to fire it would be beneficial to create patches of early seral

vegetation types across the landscape to reduce the potential for, and size of, the inevitable large fires that will occur in the next 50-100 years. Increased early seral vegetation conditions would also be beneficial for the development of young, healthy stands as well as wildlife habitat.

Gunnison Basin North & South

Vegetation

Lodgepole pine is the most common tree species occurring on the Gunnison Basin Geographic Area. This species occurs as the dominant species on 20 percent of the Geographic Area, and is a component of the species mix on an additional 9 percent of the Geographic Area. Lodgepole pine occurs naturally only on the Gunnison Basin Geographic Area portion of the GMUG.

Aspen is the second most common tree species occurring on the Gunnison Basin Geographic Area. This species occurs as the dominant species on 14 percent of the Geographic Area, and is a component of the species mix on an additional 13 percent of the Geographic Area.

The large extent of lodgepole pine and aspen is the result of large scale fires in the past (Johnston et al. 2001). As a result, the majority of this geographic area is currently in mid seral conditions.

Current vegetation classification shows approximately 46 percent of forest and woodland cover types are in the sapling/pole size class (mostly in the lodgepole pine and aspen cover types), and 53 percent are in mature size class (mostly in the spruce-fir cover type). As mentioned above, photo interpretation errors in lodgepole pine have resulted in inflating the sapling/pole size class and under representing the mature size class that actually exists.

The majority of the current forest and woodland vegetation conditions – 87 percent - have dense canopy closures (> 40 percent canopy closure).

There is very little early seral condition in any cover type on the Gunnison Basin Geographic Area.

When comparing the compositions of current vegetation cover types to PNV types, the forest type's total percentages are approximately equivalent. The majority of the Geographic Area is in mid seral stages currently dominated by lodgepole pine and aspen, however much of these areas will eventually succeed to spruce-fir and Douglas-fir. The biggest difference occurs in the grass/forb types. Much of the current grass/forb cover type is classified as early seral stages of sagebrush and willow PNV types.

The trend across all vegetation cover types on the Gunnison Basin is to continue successional progress predominantly with the absence of either natural or human-caused disturbances. Structural and compositional conditions in each cover type will continue to progress along successional timelines. A shift from aspen dominated forests to conifer dominated forests is also occurring as a result of successional changes.

Fire and Fuels

The Gunnison Basin, and particularly the aspen and spruce-fir vegetation types, has very low fire occurrence due largely to high elevations, significant snow accumulation at the higher elevations, and cool summers. Additionally, there have been significant natural fires in the 1800s, resulting in many aspen stands that are aging and just beginning to develop the fuel loadings and understories to support fire.

Just over half of the vegetation is in the mature age class, mostly consisting of spruce-fir, and much of this consists of dense, closed canopy spruce-fir. As the spruce-fir ages further there will be an increase in surface fuels and understory ladder fuels. Young spruce-fir is also encroaching into many of the aspen stands. The effects of the current beetle epidemic, which is very widespread and intense in the spruce-fir type in the geographic area, and the potential impacts of climate change, will move both the spruce-fir and aspen vegetation types to a more flammable conditions over the next few decades. There is very little early seral vegetation in the Gunnison Basin.

There are numerous Wildland Urban Interface areas in or adjacent to the Gunnison Basin aspen and spruce-fir types, including Crested Butte, Lake City, and numerous scattered small communities and subdivisions, the Crested Butte ski area, as well as several powerline corridors and communication sites.

Some modeling has shown a significant increase in future fire occurrence, size, and intensity for the Gunnison Basin due to potential impacts from climate change. In order to increase the landscapes resistance to these kinds of future disturbances there should be an effort put forth to increase the extent and health of aspen stands on the landscape and to break up the rapidly declining spruce-fir vegetation type with earlier seral stages. These efforts would be most effective near Wildland Urban Interface areas in and adjacent to the aspen and spruce-fir vegetation types but there would also be value in scattering treatments across the landscape to create resiliency and to help modify the landscape scale fuels complex, which is rapidly trending toward increased flammability.

North Fork Valley

Vegetation

Aspen is currently the dominant tree species occurring on the North Fork Valley Geographic Area, with stands dominated by aspen occurring on 40 percent of the Geographic Area and stands of aspen mixed with spruce-fir cover types currently occupying 23 percent of the Geographic Area.

The large extent of aspen is the result of large scale fires in 1878 to 1879, with less extensive burning occurring in 1883 to 1885 and again in 1890 to 1892 (Sudworth 1900), that affected the northern two-thirds of the North Fork Valley Geographic Areas. As a result, the majority of this geographic area is currently in mid seral conditions.

Approximately 31 percent of forest and woodland cover types are in the sapling/pole size class (mostly in the aspen cover type), and 58 percent are in mature size class (mostly in the spruce-fir cover type).

The majority of the current forest and woodland vegetation conditions – 87 percent - have dense canopy closures (> 40 percent canopy closure).

There is very little early seral condition in any cover type on the North Fork Valley Geographic Area.

When comparing the compositions of current vegetation cover types to PNV types, the forest type's and bare areas are approximately equivalent. The biggest differences occur in the grass/forb types; however, much of the current grass/forb cover type is also the early seral stage

of forest PNV types. Grass/forb PNV types are classified on only a very small amount (< one percent) of the North Fork Valley Geographic Area.

The trend across all vegetation cover types on the North Fork Valley Geographic Area is to continue successional progress predominantly with the absence of either natural or human-caused disturbances. Structural and compositional conditions in each cover type will continue to progress along successional timelines. A shift from aspen dominated forests to conifer dominated forests is also occurring as a result of successional changes.

Fire and Fuels

The North Fork Geographic Area, and particularly the spruce-fir and aspen vegetation types, has very little fire occurrence. Much of this Geographic Area is high elevation, receives significant winter moisture, has cool summer temperatures, and stays moist throughout most fire seasons. Additionally, a large portion of the area burned in the late 1800s, resulting in vast aspen stands that have remained relatively healthy, and lack flammability. Much of the vegetation is in a mid-seral stage and is not exhibiting flammability at this time, though with increased spruce beetle activity and the potential impacts of climate change, flammability is expected to increase.

Aspen stands are slowly being encroached on by spruce and fir but due to soil type and moisture conditions this process appears to be happening more slowly than in other locations.

There are scattered Wildland Urban Interface areas within and adjacent to the spruce-fir and aspen, in this Geographic Area, though most of them are small.

There is very little early seral vegetation in this Geographic Area. With the extent, and age, of existing aspen there are significant opportunities to maintain healthy aspen, as well as to increase the amount of early seral aspen on this landscape. Limited opportunities also exist for managing for diversity and resiliency in the spruce-fir type. Both of these opportunities would result in both decreased flammability and risk on this landscape, as well as healthier vegetation and improved wildlife habitat.

San Juan

Vegetation

Spruce-fir and aspen cover types currently occupy just over half of the NFS lands in the San Juans Geographic Area.

Grass/forb types and bare/rock each comprise 19 percent of the San Juans Geographic Area. The majority of these types are in alpine areas (elevations > 11,000 feet), with 56 percent of the grass/forb types and 86 percent of the bare/rock occurring at these elevations.

The San Juans Geographic Areas is dominated by late-mid seral conditions in forest and woodland cover types.

Approximately 86 percent of the forest and woodland cover types are in mature size classes.

The lack of recent disturbances (fire, insect and disease mortality, harvest) is also reflected in current forest and woodland vegetation conditions – 85 percent have dense canopy closures (> 40 percent canopy closure).

There is very little early seral condition in any cover type on the San Juans Geographic Area.Lack of age data does not allow differentiation between late-mid and late seral conditions in the dominant forest types.

When comparing the compositions of current vegetation cover types to PNV types, the forest type's and bare areas are approximately equivalent. The biggest differences occur in the willow and grass/forb types. There is currently less of the willow cover type and more grass/forb types on the landscape that would be expected. These conditions occur in alpine areas and are partly a result of limitations in both the current vegetation and the PNV type data. Additional evaluation is needed to determine if this shift in cover type has a relationship to past management activities, such as livestock grazing.

The trend across all vegetation cover types on the San Juans is to continue successional progress predominantly with the absence of human-caused disturbances. Structural and compositional conditions in each cover type will continue to progress along successional timelines. A shift from aspen dominated forests to conifer dominated forests is also occurring as a result of successional changes.

Fire and Fuels

The San Juan Geographic Area, and particularly the spruce-fir and aspen cover types, has very little fire occurrence. Much of this Geographic Area is high elevation, receives significant winter moisture, has cool summer temperatures, is largely north facing, and stays moist throughout most fire seasons. Additionally, as mentioned previously, these vegetation types are largely in a late mid-seral condition and are just beginning to develop fuel loadings and fuel structures that could support significant fire behavior or growth, given seasonal moisture conditions are conducive.

There are several Wildland Urban Interface areas as well as several communication sites and utility corridors, within, and adjacent to spruce-fir and aspen in this Geographic Area, including Telluride, Mountain Village, Ouray, and the Telluride Ski Area, as well as many scattered small subdivisions.

Spruce-fir and aspen stands in this Geographic Area have not experienced disturbance in at least 150-200 years and are mature and dense. As the spruce-fir ages further, increasing mortality can be expected, which will lead to increasing surface fuels, development of ladder fuels (young trees) in the understory, and increasing flammability. With additional spruce beetle mortality and the potential impacts of climate change this increased flammability could be accelerated. Fires that may occur in the future could exhibit extreme fire behavior, high resistance to control, and grow to large size, as was the case with the West Fork and Papoose Fires on the adjacent San Juan and Rio Grande National Forests in 2013. Aspen stands are aging and becoming encroached on by spruce and fir, resulting in a slow increase in flammability. Climate change may accelerate this process by drying stands out, and increasing mortality, and the accumulation of dead material, on the surface.

Some of the Wildland Urban Interface areas could have wildfire risk reduced by rejuvenating aspen stands in areas adjacent to the values at risk. Creating more diverse and resilient spruce-fir conditions in some locations would also have a long term benefit to fire management by reducing landscape scale flammability.

Uncompahgre Plateau

Vegetation

Gamble oak and mixed mountain shrub cover types currently occupy just over a quarter of the NFS lands.

Aspen currently dominates a quarter of the NFS lands.

Conifer forest and woodland cover types (pinyon-juniper, ponderosa pine, spruce-fir, Douglas-fir, blue spruce, lodgepole pine) combined make up 38 percent of the current vegetation cover on the Uncompahgre Plateau. Lodgepole pine does not naturally occur on the Uncompahgre Plateau, but was planted in the 1960s.

Most of the spruce-fir, aspen, mixed conifer, ponderosa pine, Gambel oak and mixed mountain shrub cover types within the total Geographic Area occur on NFS lands.

Most of the pinyon-juniper, cottonwood, sagebrush, willow and grass/forb cover types within the total Geographic Area occur off NFS lands on either BLM or private land.

Current vegetation conditions are a result of the disturbance history on the Uncompahgre Plateau. Large fire(s) in 1879 burned over much of the Uncompahgre Plateau Geographic Area. The majority of the forest cover types regenerated following this fire event. This is reflected in the average age of all types (80 to 120 years old), their habitat structural stages (66 percent are in mature size class) and their current seral conditions (the majority of all forest types are in mid seral conditions).

The lack of fire disturbance that has resulted from approximately 100 years of fire suppression efforts is also reflected in current vegetation conditions. Seventy-one percent of the forest and woodland cover types have dense canopy closures (> 40 percent canopy closure). There are very little early seral conditions in any cover type on the Uncompahgre Plateau. This imbalance is most pronounced in cover types that had a history of more frequent fires, such as ponderosa pine, oak-serviceberry and pinyon-juniper-oak-serviceberry types.

When comparing the compositions of current vegetation cover types to PNV types , it appears that aspen and oak currently occupy more area than would have been expected historically. This is somewhat misleading, however; because aspen and oak are both earlier seral stages to conifer dominated forest types (i.e., spruce-fir-aspen, ponderosa pine-oak), and given time, these deciduous cover types will succeed to conifer cover types.

The trend across all vegetation cover types on the Uncompahgre Plateau is to continue successional progress predominantly with the absence of either natural or human-caused disturbances. Structural and compositional conditions in each cover type will progress along successional timelines. Forest and woodland cover appears to be increasing at the expense of formerly open shrub and grasslands (Manier et al. Draft 2003). A shift from aspen dominated forests to conifer dominated forests is also occurring as a result of successional changes (Smith and Smith 2004).

Fire and Fuels

The Uncompahgre Plateau Geographic Area has the highest fire occurrence on the GMUG National Forest. The Plateau is surrounded on 3 sides by low elevation, dry, desert-like conditions and is dominated by drier vegetation types, particularly pinyon-juniper, oakbrush, and

ponderosa pine, at the mid-elevations. These vegetation types regularly support wildfires that burn upslope into higher elevation vegetation zones, such as aspen, and occasionally into spruce-fir. Major fire disturbances occurred in the late 1800's resetting a large area of the Plateau back to aspen and other early seral vegetation types.

Fire exclusion since the late 1800's has had a significant impact on the extent and composition of the drier vegetation types, particularly ponderosa pine. Due to fire exclusion, many of the higher elevation ponderosa pine stands have been encroached into by spruce and fir that was previously confined to wetter drainages which were sheltered from fire. There is very little pure spruce-fir on the Uncompahgre Plateau; most spruce-fir contains older aspen from earlier successional stages. The aspen is aging, beginning to die, and is being replaced by the spruce-fir.

Though spruce beetle occurrence on the Plateau is moderate at this time the stands are maturing and increasing beetle mortality, and increasing fuels, in the future is likely. Much of the subalpine fir in these stands has died over the past several years and surface fuels are subsequently beginning to build up at an increasing rate. With the decline of aspen, encroachment of spruce fir into aspen stands and into the more flammable ponderosa pine stands, and increasing beetle mortality, coupled with the potential impacts from future climate change, the Uncompahgre Plateau is becoming increasingly vulnerable to large scale, stand replacing fire.

There are scattered, generally small, Wildland Urban Interface areas, as well as numerous utility corridors and communication sites located throughout and adjacent to the spruce-fir and aspen types on the Uncompahgre Plateau.

Rejuvenation or restoration of aspen stands across areas of the Plateau would be highly beneficial from a fire management standpoint, as well as for wildlife habitat and the future health of aspen itself. Creating more diverse, resilient, spruce-fir stands would also be beneficial for long term fire management.

Human uses within the action area include hunting, fishing, dispersed camping, OHV riding, driving for pleasure/sight-seeing, wildlife viewing, hiking, horseback riding, picnicking, firewood gathering, snow shoeing, cross-country skiing, snowmobiling, use of all-terrain vehicles on roads, public and private land livestock grazing, special use permits and easements (includes road access permits for private land inholdings, irrigation ditches, spring developments, outfitter/guide permits, etc.) and vegetation management. Existing developments include developed campgrounds, picnic or day use areas, restrooms, trailheads, historic buildings, signs, roads, utility lines and modern houses (developed on private land). These activities and their effects are described in detail in the cumulative effects section.

SENSITIVE SPECIES CONSIDERED IN THIS ANALYSIS

The following list includes sensitive species, or their habitats, that are located on the GMUG National Forest, or are located adjacent to or downstream of the planning area and could potentially be affected. A pre-field review was conducted of available information to assemble occurrence records, and describe habitat needs and ecological requirements. Sources of information include Forest Service records and files, the State Natural Heritage Program database, state wildlife agency information, and published research (please see Literature Cited section).

No further analysis is needed for species that are not known or suspected to occur in the project area, and for which no suitable habitat is present. The following table documents the rationale for excluding a species. If suitable but unoccupied habitat is present, then potential effects are evaluated.

Table 12. List of Forest Service Sensitive Species (compiled from the Rocky Mountain Region Unit Species List, updated 10/13/2015; a full list of Region 2 Sensitive Species is available at: http://www.fs.usda.gov/detail/r2/landmanagement/?cid=stelprdb5390116)

Common Name	Scientific Name	Habitat Type	Known/suspected to be present?	Suitable habitat present ?	Rationale if not carried forward for analysis
Birds					
Northern goshawk	*Accipiter gentilis*	Coniferous and aspen forest types	Yes	Yes	
Boreal owl	*Aegolius funereus*	Spruce-fir forests	Yes	Yes	
Burrowing owl	*Athene cunicularia*	Grasslands; often associated with prairie dog colonies	No	No	There is no suitable habitat within the SBEADMR potentially affected areas[1].
American bittern	*Botaurus lentiginosus*	Wetlands/Marshes	No	No	There is no suitable habitat within the SBEADMR potentially affected areas[1].
Sagebrush sparrow	*Artemisiospiza nevadensis*	Sagebrush Ecosystem	No	No	Amount of suitable habitat within the SBEADMR potentially affected areas[1] is small, and confined to prescribed fire noncommercial Priority Treatment Areas. Sagebrush habitat is not targeted for treatments and will be avoided. Treatments will target forested areas only.
Ferruginous hawk	*Buteo regalis*	Grassland/shrubland habitats	No	No	There is no suitable habitat within the SBEADMR potentially affected areas[1].
Northern harrier	*Circus cyaneus*	Marshes/grassland/shrubland habitats; irrigated meadows	No	No	There is no suitable habitat within the SBEADMR potentially affected areas[1].
Olive-sided flycatcher	*Contopus cooperi*	Spruce-fir forests, often found on edges of openings perched on tree tops, including snags	Yes	Yes	

Common Name	Scientific Name	Habitat Type	Known/suspected to be present?	Suitable habitat present ?	Rationale if not carried forward for analysis
Black swift	*Cypseloides niger*	Perennial streams with cliffs and waterfalls	No	No	There is no known suitable habitat within the SBEADMR potentially affected areas[1]. Perennial streams will be buffered following direction in the Water Conservation Practices Handbook.
American peregrine falcon	*Falco peregrinus anatum*	Cliffs and adjacent habitat	No	No	There is no suitable habitat within the SBEADMR potentially affected areas[1].
Bald eagle	*Haliaeetus leucocephalus*	Lakes, large streams and rivers, and big game winter ranges	No	No	Pairs of eagles have been documented across the GMUG during the breeding season, and the GMUG also supports wintering eagles. While suitable nesting and wintering habitat is present, there is no suitable habitat within the SBEADMR potentially affected areas[1]. .
White-tailed ptarmigan	*Lagopus leucura*	High elevation meadows; upper limit of the subalpine zone, and alpine tundra	No	No	There is no suitable habitat within the SBEADMR potentially affected areas[1].
Loggerhead shrike	*Lanius ludovicianus*	Open woodlands	No	No	There is no suitable habitat within the SBEADMR potentially affected areas[1].
Lewis's woodpecker	*Melanerpes lewis*	Low elevation ponderosa pine forests or deciduous forests/cottonwood corridors along streams	No	No	There are documented occurrences of this species along rivers and major creeks and in cottonwood forests, but there is no suitable habitat within the SBEADMR potentially affected areas[1].
Flammulated owl	*Otus flammeolus*	Mixed conifer	Yes	Yes	

Common Name	Scientific Name	Habitat Type	Known/suspected to be present?	Suitable habitat present ?	Rationale if not carried forward for analysis
Purple martin	*Progne subis*	Mature aspen near water	Yes	Yes	
Brewer's sparrow	*Spizella breweri*	Sagebrush ecosystem	No	No	Amount of suitable habitat within the SBEADMR potentially affected areas[1] is small, and confined to burn and mechanical noncommercial Priority Treatment Areas. Sagebrush habitat is not targeted for treatments and will be avoided. Treatments will target forested areas only.
Columbian sharp tailed grouse	*Tympanuchus phasianellus columbianus*	Mountain shrub and grassland habitats	No	No	There is no suitable habitat within the SBEADMR potentially affected areas[1]
Amphibians					
Boreal Toad	*Anaxyrus boreas boreas*	Marshes, springs, wet meadows, margins of streams, beaver ponds, glacial ponds	Yes	Yes	**Not analyzed in this document. Please see the Sensitive/MIS Report for fisheries and amphibians, available in the project file.**
Northern leopard frog	*Lithobates pipiens*	Variety of usually permanent water sources (especially rooted aquatic vegetation) including banks and shallow areas of marshes, ponds, lakes, reservoirs, streams, springs, and irrigation ditches.	Yes	Yes	**Not analyzed in this document. Please see the Sensitive/MIS Report for fisheries and amphibians, available in the project file.**
Mammals					
Townsend's big-eared bat	*Corynorhinus townsendii*	Found up to 9,500 feet in elevation. Uses caves, mines, buildings; rock fissures used for roosting and hibernation. Forages in open woodlands, along forest edges, and over water.	No	No	There is no suitable habitat within the SBEADMR potentially affected areas[1]
Spotted bat	*Euderma maculatum*	Likely elevation range of occurrence 6,000-8,000 feet in Colorado. Cliffs, ponderosa pine, pinyon-juniper, desert scrub; rough, arid desert terrain. Wet meadows used for foraging.	No	No	There is no suitable habitat within the SBEADMR potentially affected areas[1].

Common Name	Scientific Name	Habitat Type	Known/suspected to be present?	Suitable habitat present ?	Rationale if not carried forward for analysis
Hoary bat	*Lasiurus cinereus*	Low elevation forests (1,900 – 9,100 feet) including heavy forests, trees at edges of clearings, open wooded glades, urban areas/city parks; forages along tree tops, streams and lake shores.	Yes	Yes	
River otter	*Lontra canadensis*	Permanent water of relatively high quality – rivers, major streams or other waterbodies.	No	No	While documented in rivers that occur on portions of the GMUG, there is no suitable habitat within the SBEADMR potentially affected areas[1]
American marten	*Martes americana*	Coniferous forests – spruce-fir, lodgepole pine, mixed spruce-fir/aspen forests; mature and old growth forest conditions with abundant course woody debris	Yes	Yes	
Fringed myotis	*Myotis thysanodes*	Coniferous woodlands and greasewood, oakbrush, and saltbrush shrublands at elevations from 5,000 to 7,500 feet. Caves, mines, and stone buildings serve as roost and hibernations.	No	No	There is no suitable habitat within the SBEADMR potentially affected areas[1]
Rocky Mountain bighorn sheep	*Ovis canadensis canadensis*	Summer habitat – high mountain meadows and forests, including cliffs or other steep rocky areas; winter – lower elevation meadows, shrublands and montane forests. Often uses these types of habitats in remote Wilderness areas and Roadless areas.	No	No	There is no suitable habitat within the SBEADMR potentially affected areas[1]
Desert bighorn sheep	*Ovis canadensis nelsoni*	Rough, rocky areas with canyons and washes. Similar to Rocky Mountain bighorn sheep, they typically avoid low visibility areas with dense vegetation and depend on steep slopes for lambing and to more easily detect and escape from predators.	No	No	There is no suitable habitat within the SBEADMR potentially affected areas[1]
Pygmy shrew	*Sorex hoyi*	Moist boreal coniferous forests above 9,600 feet.	Yes	Yes	
Kit fox	*Vulpes macrotis*	Deserts and semiarid habitats, mixed-grass shrublands, shrublands, and margins of pinyon-juniper woodlands. Elevation range of occurrence: 1,300 – 6,200	No	No	There is no suitable habitat within the SBEADMR potentially affected areas[1]

Common Name	Scientific Name	Habitat Type	Known/suspected to be present?	Suitable habitat present ?	Rationale if not carried forward for analysis
		feet. Also uses agricultural lands and urban environments.			
Gunnison's prairie dog	*Cynomys gunnisoni*	Grasslands and semi-desert or montane shrublands.	No	No	There is no suitable habitat within the SBEADMR potentially affected areas[1]
White-tailed prairie dog	*Cynomys leucurus*	Desert grasslands and shrub grasslands.	No	No	There is no suitable habitat within the SBEADMR potentially affected areas[1]
North American wolverine	*Gulo gulo*	Remote subalpine and spruce-fir forests; alpine; requires areas that reliably have deep persistent snow late into the warm season (Copeland et al. 2010)	No	Yes	Given that potential habitat associated with the action alternatives is currently unoccupied, there will be no effect to the species. However, even if the species eventually recolonizes Colorado, vegetation management activities, such as salvage harvest, are not expected to have measurable influences on wolverines because they are not identified as a potential threat to the species (USFWS: http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=A0FA#lifeHistory). The North American wolverine was recently considered by USFWS for Endangered Species Act protections as a Proposed species, and was considered in the Biological Assessment for Federally listed species.

Common Name	Scientific Name	Habitat Type	Known/suspected to be present?	Suitable habitat present ?	Rationale if not carried forward for analysis
Insects					
Western bumblebee	*Bombus occidentalis*	Grasslands with wild flowering plants; croplands. On the GMUG NF, this species is documented in mountain meadows with flowering plants. Although significant declines are documented throughout the species range, populations appear stable locally likely due to a lack of threats (invasive plants and insects).	No	No	There is no suitable habitat within the SBEADMR potentially affected areas[1].
Monarch butterfly	*Danaus plexippus plexippus*	Areas with milkweed – milkweed dependent species for laying eggs and food for caterpillars	No	No	There is no suitable habitat within the SBEADMR potentially affected areas[1]

[1]Potentially affected areas: includes all commercial and noncommercial activities in priority treatment areas, hazard tree removal, and new roads.

Prior to implementation, field reconnaissance will be completed for individual projects resulting from the SBEADMR EIS. The Forest Service Region 2 Regional Forester's Sensitive Species list will be reviewed annually for changes to the list and species not previously considered in this analysis will be evaluated and impacts disclosed as part of the Pre-Treatment Checklist (Appendix C of the Final EIS).

SENSITIVE SPECIES INFORMATION

Northern Goshawk ***Accipiter gentilis***

The northern goshawk is also addressed in this document as a GMUG NF Management Indicator Species (MIS). They are distributed across North America in coniferous, deciduous and mixed forests in low densities throughout its Holarctic distribution. Their range extends from the boreal forests in Alaska and Canada to Newfoundland, south to the montane forests of the west, and into the mountains of western and northwestern Mexico (Squires and Reynolds 1997). They are known to winter throughout their breeding range and as far south as southern California, northern Mexico, Texas, and the northern portions of the Gulf States, rarely including Florida (Johnsgard 1990, Squires and Reynolds 1997).

Northern Goshawks can be found in middle and higher elevation mature coniferous forests; usually with little understory vegetation and flat or moderately sloping terrain. Moderate and high quality habitats contain abundant large snags and large logs for prey habitat and plucking posts (Squires and Reynolds 1997). Goshawks generally breed in mature, coniferous, mixed, and deciduous forest habitats. This habitat provides large trees for nesting, a closed canopy for protection and thermal cover, and open spaces allowing maneuverability below the canopy.

In Colorado, goshawks are found in the forested mountains across the state (Kingery 1998). According to Kingery, they are well distributed in the San Juan Mountains, across the Uncompahgre Plateau, and the northern mountains. There does appear to be a large gap in goshawk presence in the central and south-central portions of Colorado that Kingery describes as holes in the distribution of this species. However, goshawks are known to occur and appear well distributed on the GMUG NF based on the distribution of known nest sites and goshawk sightings, although knowledge of the distribution and abundance of this species across the Forest is limited (USDA Forest Service 2005). In Colorado, northern goshawks are found to nest in lodgepole pine and aspen stands (Kennedy 2003). On the GMUG National Forests, most goshawk nests have been found in mature aspen (USDA Forest Service 2005: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5199933.pdf).

The population trend is considered to be declining in the Central Rocky Mountain Physiographic Region based on Partners in Flight data (PIF 2013). The primary threat to goshawk populations is habitat alteration due to timber management practices (Kennedy 2003, Colorado PIF 2000). Timber harvest is a primary threat to nesting populations (Squires and Reynolds 1997). Nests can be destroyed by harvest activities and harvest methods that create large areas of reduced forest canopy cover may be especially detrimental (Squires and Reynolds 1997). In California, nesting densities remained fairly high despite fragmentation of mature forests through timber harvest (Woodbridge and Detrich 1994); however, territories associated with large contiguous forest patches were more consistently occupied compared to highly fragmented stands. Timber harvest activities near nests can cause abandonment (Squires and Reynolds 1997).

On the GMUG National Forests, breeding season begins in March, with nest initiation and egg-laying in April, incubation in May and June, and young hatching by mid- to late June. The young fledge approximately mid-August. Incubation takes between 36-41 days and the young fledge at about 45 days. Young are independent by about 70 days after fledging, so the young are vulnerable from mid-June until mid-October. They forage on various species of birds and mammals.

There is suitable habitat and known nest sites in the SBEADMR planning area. There are over 180 recorded observations of northern goshawks across the GMUG of which 85 are occurrences within or near PTAs for the SBEADMR project. In compliance with GMUG Forest Plan Standards and Guidelines, timing restrictions will be applied to occupied nests with a minimum buffer distance of 0.25 mi, and a maximum distance of 0.5 mi. Design features will also protect nesting habitat at nest sites and maintain habitat requirements within the Post Fledging Area (PFA) surrounding nest sites.

Boreal Owl ***Aegolius funereus***

Boreal owl distribution follows that of the boreal forest from central Alaska south and east in a broad band across Canada into the Great Lakes states and down to the Northern Rockies. They are also found in the Southern Rockies although this population appears geographically separated from the rest of the population. This species of owl is primarily found in mature and old growth coniferous forests especially spruce-fir and occasionally in lodgepole pine stands. Occupied sites are in stands that have a high basal area, a high amount of large trees, a high canopy cover, and a low amount of understory vegetation. They are secondary cavity nesters and use natural or cavities excavated by woodpeckers in large live trees and snags. Their distribution and

population is tied to nest cavity and prey availability. There is no population data available for this species in Colorado.

The boreal owl does not migrate but will move to different nesting areas in response to prey availability. They will begin to nest as early as mid-April and young fledge by mid-June. They forage on small mammals preferably on red-backed voles. Boreal owls have an estimated home range of 3,700 acres.

There is suitable boreal owl habitat in the SBEADMR project area and over 300 recorded occurrences across the GMUG NF. The majority of these occurrences are within PTAs. Most sightings have been recorded on the Grand Mesa portion of the forest with only 14 documented occurrences on the Uncompahgre and five occurrences on the Gunnison portions. The majority of sightings are in a spruce-conifer mix habitat type.

Flammulated owl ***Otus flammeolus***

The flammulated owl is distributed from southern British Columbia south through the Rocky Mountains into western Mexico and as far west as southern California. These owls are found in old-growth or mature ponderosa pine stands as well as open mixed conifer and aspen forests that contain large broken top and lightning damaged snags and trees. There is no change in their distribution as they are still found in their historic range. Little is known about the population trend for this species.

In Colorado, flammulated owls arrive in late April to early May for the breeding season. They lay eggs in May and June and the young hatch in June and early July. Young fledge by the end of July. They remain in the area until early October and migrate to their winter grounds in southern Mexico and Central America. Flammulated owls feed on invertebrates including moths, beetles, crickets and grasshoppers.

There is suitable habitat for flammulated owls in the SBEADMR project area, with over 100 documented occurrences. Most documented occurrences are on the Uncompahagre Plateau and three occurrences are on the Gunnison Ranger District all within or near PTAs that could be treated under the action alternatives. Most occurrences are located in aspen stands and aspen/spruce or aspen/Douglas fir mix stands.

Purple Martin ***Progne subis***

The purple martin is a migratory species that breeds throughout North America, along the Pacific Northwest coast, in patches in the southern Rocky Mountains and Sierra Madre Occidental and into low elevation deserts in Arizona, Baja California and southwestern Mexico. The purple martin winters in central South American lowlands. In Colorado, they are restricted to western slope aspen forests and are thought to be patchily distributed. On the GMUG, they have been found on the Uncompahgre Plateau, North Fork Valley on the Paonia Ranger District, north of the town of Gothic on the Gunnison Ranger District and the San Juan Mountains. The population trend for martins varies across its range in Colorado with increases in the northwest and decreases in the southwest. Habitat for martins in Colorado is characterized as mature (>60 years) aspen stands on gentle slopes adjacent to large forest openings. Key habitat features for purple martins include live aspen trees with a diameter at breast height of at least 14 inches, nest trees that are located within 175 feet of open meadows and within 1,000 feet of standing water which are areas where martins forage.

Martins arrive in Colorado April through May and remain until September. Upon arrival, males begin to select and defend nest sites. They also begin to advertise to arriving females through a flight display. Once pairs are formed, females begin nest construction. Clutch size on average for martins is 4-5 eggs and incubation is 15 to 18 days. Hatching occurs over a 48 hour period usually in June and young will fledge in early July. Martins feed primarily on flying insects focusing on those species that are easily available.

Suitable habitat does exist for purple martins in the SBEADMR project area. Colonies have been documented in the North Fork area on the Paonia Ranger District. Local populations may be particularly susceptible to forest management practices that affect their primary breeding habitat, mature aspen stands (Wiggins 2005).

Olive-sided Flycatcher ***Contopus cooperi***

The olive-sided flycatcher distribution follows the distribution of boreal forests from central Alaska south and east in a broad band across Canada. Populations are also found in southern California and through the Rockies into southern New Mexico. They are found in mature spruce-fir and mixed conifer forests and are closely associated with burned areas where they take advantage of the open forest structure for prey. They tend to hunt from snags or trees that extend beyond the canopy. The distribution and population trend of olive-sided flycatchers has not shown any significant change based on Breeding Bird Survey (BBS) data for Colorado. They are however, declining in other parts of their range.

In Colorado, olive-sided flycatchers arrive to their breeding grounds in May. They begin nesting in late May and young fledge by August. By early September, they migrate to their winter grounds in southern Mexico and Central America. Olive-sided flycatchers feed on flying insects, particularly bees and flies.

Suitable habitat does exist for olive-sided flycatchers in the SBEADMR project area. This species is thought to be widespread across the forest based on sightings and audible detections observed by local biologists (Vasquez, pers. comm., 2014). There are known documented occurrences of this species on the Uncompahgre Plateau and Gunnison Ranger District. Anecdotally, GMUG National Forest biologists see and hear this species on numerous occasions during the breeding season where suitable habitat is present. This species likely occurs throughout the GMUG National Forest, including within PTAs.

Hoary Bat ***Lasiurus cinereus***

The hoary bat ranges from northern Canada to Guatemala and likely occurs in the lower 48 states and Hawaii. In Colorado, this species probably occurs across the state from the plains to timberline from April to November. There are no records of hoary bats hibernating in Colorado.

The hoary bat is a tree-roosting species, living in any habitat that has trees. It is a solitary species, particularly in the summer when females give birth and rear young. This is likely due to reduce competition for food (Colorado Parks and Wildlife, 2013). Both sexes do migrate north together in the spring. Hoary bats forage on insects, preferably moths, but have been found to feed on beetles, wasps, grasshoppers and even small bats. Little is known about the life history of this species.

There is suitable habitat for hoary bats in the SBEADMR project area; however there are no known observations documented on the GMUG NF.

American Marten ***Martes Americana***

The American marten is also analyzed as a management indicator species in this document. They are known to occur in coniferous forests in northern and western North America. In Colorado, they are found in old-growth subalpine forests of spruce, fir or lodgepole pine and prefer mesic mature coniferous forests, with a complex physical structure near the ground (Watt et al. 1996). Canopy cover in mature forests where martens are found is typically 30-70% which reduces snow depth and moderates winter temperatures which is important to marten survival. These features provide den sites, resting sites, thermal cover, and protection from predators. Den and resting sites are found in live trees, snags, logs and root balls depending on the season (Watt et al. 1996). A portion of these structures must be large enough for the rearing of young. Subnivean spaces created by coarse woody debris and exposed saplings are important for providing adequate hunting terrain and thermal cover in winter. Importantly, riparian and stream corridors are utilized for hunting and determining marten home ranges (Spencer et al. 1983, Jones and Raphael 1990). The Forest currently supports approximately 600,925 acres of denning, resting and foraging habitat for Marten. This is approximately eighteen percent of the land base of the Forest. Sixteen percent of the Forest is primary (moderate and high quality) denning/resting and foraging habitat that is contiguous to other suitable habitat. Approximately 30,268 acres of primary habitat with patch sizes greater than 37 acres is isolated from other suitable habitat.

There have been documented occurrences of marten in lodgepole pine forests on the Gunnison Ranger District. These cover types with marten occurrences have typically been associated with large diameter downed wood, large diameter standing trees, leaning logs and trees, decayed or overturned stumps, snags and coarse woody debris in various decay stages, and large rocks, trees, or saplings. Where marten detections have occurred in aspen, spruce-fir has been a component of the tree species mix within those stands or spruce-fir stands were adjacent to those aspen stands.

The American red squirrels (*Tamiasciurus hudsonicus*) is an important prey species for marten. Martens also feed on nesting birds and prey on red-backed voles. In the winter, logs provide martens with access to subnivean (under snow) areas for foraging and resting (Ruggiero, et al. 1994). Selection of den sites may depend on ambient air temperatures. Subnivean sites and logs used as winter dens may reduce thermo-regulatory stress.

Marten dens are located in cavities in large trees, snags, stump, and logs line with leaves, grass, mosses, or other vegetation. Breeding occurs in summer with a gestation period of 220 to 290 days, which includes a long period of delayed implantation. The embryos are usually implanted in early spring, having a growing period of about 27 days prior to birth. Most litters are born in April. Litters consist of one to five young that are blind and nearly naked. They develop rapidly and are weaned at about two months. No species are known to habitually prey on marten. The main threats to martens are trapping and habitat destruction due to clear-cutting.

Martens generally occupy stands that are located within ¼ mile from water with forest openings less than one acre in size. They are most abundant in forested areas adjacent to meadows or riparian corridors, but use travel ways comprised of closed canopy forests to move between foraging areas (Powell and Zielinski 1994, Ruggiero 1994). Martens generally avoid habitats that lack overhead cover, and tend to avoid crossing large openings (>300 feet), especially in winter. However, when they do use or cross these areas, they tend to focus on coarse (large) woody debris, low growing branches, or patches of shrub.

Several aspects of marten life history predispose it to being affected by human activities including: its habitat specialization for mesic, structurally complex forests; its low population densities; and its low reproductive rate for a mammal of its size (Ruggiero 1994).

There is suitable habitat for martens in the SBEADMR project area, with over 69 recorded observations of martens across the GMUG NF based on incidental sightings and surveys using baited cameras and track plates. Marten occurrences are within mature spruce-fir and lodgepole pine forests on the GMUG NF. GMUG NF Wildlife biologists have only detected martens once or twice on the Uncompahgre Plateau but haven't monitored specifically for them in the Uncompahgre Plateau Geographic Area (Holguin pers. comm. December 15, 2015).

Pygmy Shrew ***Sorex hoyi***

The pygmy shrew range includes Alaska into British Columbia and across central and southern Canada, the Great Lakes region, New England to Nova Scotia and coastal Maine, down to the Appalachian Mountains down to the Cumberland Plateau and into northern Georgia and Alabama. It is also extends southward from the Rocky Mountains into Idaho, northwestern Montana with isolated occurrences in the Southern Rocky Mountains of Colorado and Wyoming. Little is known about the abundance or population trend, but it is thought to be more abundant at boreal latitudes and less abundant in the southern portion of its range. They are found in moist and forested habitats including late seral spruce-fir stands which usually have a high amount of coarse woody debris on the ground.

Pygmy shrews breed in July with young born in late July to mid-August. Young are born in protected vegetation lined nests and litter size is three to seven. Young become independent at three to five weeks after birth. They feed primarily on insects with limited amounts of vegetation such as seeds and berries.

There is suitable habitat for pygmy shrews in the SBEADMR project area and two recorded occurrences of this species on the Forest. Both are located in the north-central portion of the Forest outside of areas available for treatment.

ANALYSIS AND DETERMINATIONS OF EFFECTS ON SENSITIVE SPECIES

METHODOLOGY

The following analysis is based upon professional knowledge, the best available science, and existing best available information Effects are analyzed for known occurrences and for potential habitats which will be discussed in the context of occupied habitats. As the main difference between the alternatives is the spatial area that they could occur in, a comparison of Priority Treatment Areas, hazard tree treatments, and new roads that are outside PTA's (all three activities together will be referred to as "potential affected areas") will be a proxy for magnitude of impacts. Commercial and/or non-commercial treatments will be applied within identified treatment areas only. Commercial treatments include; resiliency (<40% overstory mortality), recovery and resiliency (>40% and <90% overstory mortality), and recovery (>90% overstory mortality). Non-commercial treatments include; burn/mechanical and burning). Road construction and re-construction are only associated with commercial treatments.

Scope of Analysis

This project uses the potential affected areas to indicate areas on the GMUG where these activities could occur. The potential affected areas are assessed spatially by Geographic Area of occurrence (Grand Mesa, Gunnison Basin North, Gunnison Basin South, North Fork Valley, San Juan, and Uncompahgre Plateau). Treatment types have been identified along with estimated acres associated with each action in each treatment area. Based on current stand conditions and alternatives we expect 7-15% salvage, 47-49% variable retention regeneration (combination), and 38-44 % resiliency treatments. As the level of spruce-beetle induced mortality changes, acres of resiliency and variable retention have the potential to shift towards salvage. This ladder scenario is also analyzed and is referred to as "adapted treatment type".

Analysis of impacts to Forest Service sensitive and GMUG NF Management Indicator Species were completed by comparing treatment outcomes based upon the vegetative indicators within the silvicultural and prescribed fire prescription matrix (Appendix B of this report) and the use of design features (Appendix C of this report) to minimize impacts or achieve a desired outcome. Treatment type and resulting post-treatment vegetative conditions were compared to the biological needs of affected species. Through the analysis process, recommendations to further minimize effects were made to refine treatment methods or design features as needed. The wildlife design features are products of this analysis process and public input received on the Draft EIS.

For Forest Service sensitive species and GMUG NF management indicator species, design features will avoid or minimize negative impacts. This includes limited operating periods to minimize impacts during the breeding season, the retention of snags and coarse woody debris including large diameter logs across the landscape, and maintaining vegetation for habitat connectivity and cover, consistent with GMUG Forest Plan direction. Appendix D of this report describes the avoidance or minimizing impact mechanism addressed by each design feature.

Effects of the No Action Alternative – Alternative 1

Direct and Indirect

There will be no human-induced direct and indirect effects as a result of Alternative 1. There would be no treatments under this alternative and terrestrial wildlife species and their habitats would continue to be influenced by natural ecosystem processes.

Cumulative

Under the no action alternative there would be no increase in cumulative effects because no federal actions would occur to add to activities occurring in the past, present or in the future. Natural processes would continue to affect wildlife resources, with the spruce beetle epidemic causing dynamic changes across the landscape throughout all Geographic Areas. Large-scale natural disturbance processes are an important part of ecosystem function and contribute to biodiversity.

Direct and Indirect Effects Common to all Action Alternatives (Agency Preferred Alternative – Alternative 2; and WUI Alternative – Alternative 3)

Northern Goshawk

In general, direct effects to northern goshawks from treatment activities include noise due to the presence of heavy equipment operations, chainsaws, the presence of personnel and smoke associated with prescribed fire activities. Noise disturbance and smoke may result in the temporary displacement of goshawks during treatment activities. Design features included in the proposed action and in compliance with Forest Plan direction will restrict activities during the breeding season and will also require raptor surveys to determine the locations of individuals (particularly active nest sites) or populations each year. These design features will minimize impacts to active goshawk nest sites and provide protection to these sites during implementation of the proposed action. Disturbance to foraging goshawks from noise created by treatment activities could cause the birds to abandon the area temporarily.

On the GMUG NF, goshawks have been primarily documented to nest in mature aspen-dominated stands mixed with conifers, including Engelmann spruce and lodgepole pine. A low percentage of known nests are in mature lodgepole pine or ponderosa pine stands. It is unlikely that treatments to spruce-fir will affect nesting habitat for goshawks. It may, however affect foraging habitat and may indirectly affect prey species. Indirect effects are generally associated with habitat modification or removal (Tables 16 and Table 17 describe indirect effects). Table 13, Table 14, and Table15 quantifies acres of potential goshawk nesting that may be affected from Alternatives 2 and 3. Appendix A (Figure A-3 and A-4) of this report contains maps showing potentially affected habitat under each action alternative.

Table 13 - Activities proposed under alternative 2 - overlap with goshawk nesting habitat (acres and % of total) within each Geographic Area(see Appendix A; Figure A-3 of this report)

Geographic Area	Goshawk Nesting Habitat?	Hazard Trees	New Roads Outside PTA	Priority Treatment Area (PTA)					PTA Total	Grand Total[1]
				Noncommercial		Commercial				
				Burn and Mechanical	Mechanical	Combination	Resiliency	Salvage		
Grand Mesa	Goshawk Nesting Habitat	17	1	11,241	475	1,243	2,299	56	15,314	**15,332 (38%)**
	Not Goshawk Nesting Habitat	1,058	18	10,680	969	7,565	3,865	429	23,508	**24,584 (62%)**
	Total	**1,075**	**19**	**21,920**	**1,445**	**8,808**	**6,163**	**486**	**38,822**	**39,916**
Gunnison Basin North	Goshawk Nesting Habitat	113	1	8,557	-	1,178	1,526	103	11,363	**11,478 (17%)**
	Not Goshawk Nesting Habitat	3,583	48	39,829	-	5,719	5,137	1,722	52,408	**56,038 (83%)**
	Total	**3,696**	**49**	**48,386**	-	**6,897**	**6,663**	**1,825**	**63,771**	**67,516**
Gunnison Basin South	Goshawk Nesting Habitat	215	1	5,272	-	1,938	714	627	8,551	**8,767 (17%)**
	Not Goshawk Nesting Habitat	4,579	43	13,228	-	9,396	3,705	11,434	37,764	**42,385 (83%)**
	Total	**4,794**	**44**	**18,500**	-	**11,334**	**4,419**	**12,061**	**46,315**	**51,152**
North Fork Valley	Goshawk Nesting Habitat	91	0	1,120	-	841	928	78	2,967	**3,058 (13%)**
	Not Goshawk Nesting Habitat	2,167	25	11,104	920	2,516	4,097	466	19,103	**21,294 (87%)**
	Total	**2,258**	**25**	**12,225**	**920**	**3,356**	**5,025**	**544**	**22,070**	**24,352**
San Juans	Goshawk Nesting Habitat	56	3	323	-	1,631	1,082	205	3,242	**3,301 (22%)**
	Not Goshawk Nesting Habitat	1,967	39	107	-	6,141	1,513	1,625	9,386	**11,392 (78%)**
	Total	**2,023**	**42**	**430**	-	**7,773**	**2,595**	**1,830**	**12,628**	**14,692**
Uncompahgre Plateau	Goshawk Nesting Habitat	51	6	15,964	-	8,387	9,756	238	34,345	**34,402 (44%)**
	Not Goshawk Nesting Habitat	3,490	28	25,266	-	6,610	7,878	119	39,873	**43,392 (56%)**
	Total	**3,541**	**34**	**41,231**	-	**14,997**	**17,634**	**357**	**74,219**	**77,795**
	Grand Total	**17,387**	**213**	**142,691**	**2,365**	**53,166**	**42,499**	**17,103**	**257,823**	**275,424**

[1]There are a total of 275,424 acres where proposed activities under Alternative 2 could occur. Of those acres, 76,338 (28%) are in mapped goshawk nesting habitat. Prior to implementation, field surveys would verify where suitable habitat occurs in project areas and appropriate design features would be applied to protect nest sites and manage nesting habitat based on best available science. This analysis represents the maximum area where activities could potentially occur spatially and temporally during the life of the project (8 - 12 years). During the life of the project, these proposed activities have the potential to affect up to 12% of the total nesting habitat on the GMUG National Forests.

Table 14 - Activities proposed under alternative 3 - overlap with goshawk nesting habitat (acres and % of total) within each Geographic Area(see Appendix A; Figure A-4 of this report)

Geographic Area	Goshawk Nesting Habitat?	Hazard Trees	New Roads Outside PTA	Priority Treatment Area (PTA)					PTA Total	Grand Total[1]
				Noncommercial		Commercial				
				Burn and Mechanical	Mechanical	Combination	Resiliency	Salvage		
Grand Mesa	Goshawk Nesting Habitat	33	4	8,905	475	738	1,745	54	11,917	**11,955 (40%)**
	Not Goshawk Nesting Habitat	1,483	24	8,405	969	4,545	1,859	322	16,101	**17,608 (60%)**
	Total	**1,516**	**28**	**17,310**	**1,445**	**5,283**	**3,605**	**376**	**28,018**	**29,563**
Gunnison Basin North	Goshawk Nesting Habitat	158	2	5,812	-	398	961	38	7,209	**7,369 (16%)**
	Not Goshawk Nesting Habitat	5,083	42	29,769	-	1,588	1,284	694	33,335	**38,460 (84%)**
	Total	**5,241**	**45**	**35,581**	**-**	**1,986**	**2,245**	**732**	**40,544**	**45,829**
Gunnison Basin South	Goshawk Nesting Habitat	300	3	2,243	-	374	270	31	2,918	**3,220 (17%)**
	Not Goshawk Nesting Habitat	7,113	17	5,048	-	1,263	730	1,228	8,269	**15,399 (83%)**
	Total	**7,413**	**20**	**7,291**	**-**	**1,637**	**999**	**1,259**	**11,187**	**18,619**
North Fork Valley	Goshawk Nesting Habitat	102	1	450	-	559	860	56	1,925	**2,028 (10%)**
	Not Goshawk Nesting Habitat	2,714	20	9,027	897	1,202	3,434		14,560	**17,294 (90%)**
	Total	**2,816**	**20**	**9,477**	**897**	**1,761**	**4,293**	**56**	**16,485**	**19,322**
San Juans	Goshawk Nesting Habitat	56	3	323	-	1,395	370	162	2,249	**2,308 (29%)**
	Not Goshawk Nesting Habitat	2,460	20	107	-	1,742	706	490	3,045	**5,525 (71%)**
	Total	**2,516**	**22**	**430**	**-**	**3,137**	**1,076**	**652**	**5,294**	**7,833**
Uncompahgre Plateau	Goshawk Nesting Habitat	66	7	13,209	-	4,773	4,103	144	22,230	**22,303 (40%)**
	Not Goshawk Nesting Habitat	5,125	27	20,193	-	3,992	3,783	73	28,042	**33,194 (60%)**
	Total	**5,192**	**34**	**33,403**	**-**	**8,766**	**7,886**	**218**	**50,272**	**55,497**
	Grand Total	**24,694**	**169**	**103,491**	**2,342**	**22,571**	**20,103**	**3,293**	**151,800**	**176,662**

[1]There are a total of 176,662 acres where proposed activities under Alternative 3 could occur. Of those acres, 49,183 (28%) are in mapped goshawk nesting habitat. Prior to implementation, field surveys would verify where suitable habitat occurs in project areas and appropriate design features would be applied to protect nest sites and manage nesting habitat based on best available science. This analysis represents the maximum area where activities could potentially occur spatially and temporally during the life of the project (8 - 12 years). During the life of the project, these proposed activities have the potential to affect up to 7.8% of the total nesting habitat on the GMUG National Forests.

Table 15 - Comparison of Alternatives (acres and % of total)

Geographic Area (GA)	Alt. 2 Potentially Affected Areas[1]	Alt. 3 Potentially Affected Areas	Goshawk Nesting Habitat (Baseline)[2]	Goshawk Nesting Habitat Potentially Affected by Alt. 2 (% of Total Nesting Habitat)	Goshawk Nesting Habitat Potentially Affected by Alt. 3 (% of Total Nesting Habitat)
Grand Mesa	39,916	29,563	94,816	15,332 (16)	11,955 (13)
Gunnison Basin North	67,516	45,829	140,467	11,478 (8)	7,369 (5)
Gunnison Basin South	51,152	18,619	85,172	8,767 (10)	3,220 (4)
North Fork Valley	24,352	19,322	108,477	3,058 (3)	2,028 (2)
San Juans	14,692	7,833	73,180	3,301 (5)	2,308 (3)
Uncompahgre Plateau	77,795	55,497	126,939	34,402 (27)	22,303 (18)
Grand Total	**275,423**	**176,663**	**629,051**	**76,338 (12)**	**49,183 (8)**

[1]Potentially affected areas: includes all commercial and noncommercial activities in Priority Treatment Areas, hazard tree removal areas, and area affected by new roads outside PTAs.

[2]This is all modeled goshawk nesting habitat for the GMUG National Forests based on the GMUG 2005 MIS Assessment (http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5199933.pdf)

The proposed action will reduce ground and surface fuels by removing dead and dying trees. Prescribed fire treatments such as pile burning will also reduce fuels generated by treatment activities. Fuel treatments may benefit northern goshawks and their habitat in the long term by improving the health of forested stands if they are successful in increasing age-class diversity and promoting aspen regeneration. In addition, resiliency treatments would increase age class diversity and tree species composition which would increase the diversity of habitats for goshawks. This could benefit foraging habitat and their prey species in the long-term.

Table 16 is a summary of effects to goshawks in spruce stands as a result of treatment activities based on stand mortality and Table 17 is a summary of effects to goshawks, flammulated owls and purple martins in aspen stands.

Table 16. Effects of Silvicultural Treatments to Goshawks in Spruce – Fir Stands

Stand Condition	Overstory Mortality Level	Treatment	Effects to Goshawk Habitat
Single Storied	<40%	• Individual tree selection. • Removal focused on pockets of dead and dying spruce-fir. • Harvest 15-25% of stand. • May require mechanical site prep.	Spruce fir stands are not preferred by goshawk as nesting/roosting habitat on the GMUG but goshawks will utilize these stands for foraging. Treatments will remove individual or pockets of trees with the majority of the area remaining as it exists. Habitat for prey species will be affected in patches due to decreases in canopy cover, stand density and coarse woody debris. Design features will ensure maintenance of down woody debris and protection of habitat directly around nest sites and within Post Fledging Areas from disturbance when nests are active. Overall, foraging habitat will remain across the landscape.
	Between 40-90%	• Remove all dead and dying spruce-fir in areas where adequate seed source exists. • Group selection where mortality is patchy. • Clear cut where mortality is extensive. • Create small openings in areas where <40% mortality occurs. • Maximum removal is 40% of present stocking within residual stand to maintain wind "firmness". • May require mechanical site prep.	These stands may be used by goshawks as foraging habitat. Treatments may degrade habitat for prey species because of a decrease in canopy cover, stand density and coarse woody debris. As a result foraging habitat may also be degraded. Design features will ensure maintenance of snags and retention of down woody debris and protection of habitat directly around occupied nest sites from disturbance during operations, and maintaining uncut areas important for foraging habitat. Overall, foraging habitat will remain across the landscape. Stands will also have lower canopy cover across the landscape as a result of proposed treatments. Goshawks require canopy cover over 40% and it is likely the majority of stands will fall below that level as trees die and fall or as a result of treatment. In areas where canopy cover is low, goshawks are unlikely to use those areas. However patches of habitat may be available after treatments are completed and may be used by goshawks depending on the size and proximity of suitable habitat. Goshawks may also hunt along edges of openings and within small meadows during the breeding season, thus treatments are not anticipated to render habitat unsuitable.

Stand Condition	Overstory Mortality Level	Treatment	Effects to Goshawk Habitat
	>90%	• Remove all dead and dying spruce-fir where there is no adequate natural seed source. • Clear cut where mortality is extensive. • May require mechanical site prep.	Due to the lack of overstory canopy cover, goshawks are not expected to use these areas where treatment units are large. Stands may be too open after treatments with decreased canopy cover, stand density, coarse woody debris as well as the incidental reduction in understory vegetation components. When nest sites are discovered in the planning area, design features will be applied providing protection of habitat directly around occupied nest sites from disturbance during operations, protections to the Post Fledging Area, and maintaining uncut areas important for foraging habitat.
Two Storied	<40% and ≥35% DHC and advanced regeneration above mean snow depth	• Individual tree selection or group selection in 0.25 to 2 acre openings. • Removal focused on pockets of dead and dying spruce-fir.	Although spruce fir has been found not to be a preferred nesting habitat type for goshawks on the GMUG, these stands could provide suitable nesting/roosting habitat if the stand contains large trees and high canopy cover. Otherwise the area is suitable foraging habitat. Treatments will have a minimal effect to goshawk habitat. Only pockets of trees or individual trees will be removed. Habitat for prey species will be affected in patches, but is not expected to result in changes in overall population abundance. Foraging habitat will be maintained across the landscape. Treatments are intended to create multiple age classes of trees and increase. Increased habitat diversity will benefit goshawks in the long term.
	<40% and <35%DHC	• Individual tree selection or group selection in 0.25 to 2 acre openings. • Remove dead and dying spruce-fir.	These stands may provide nesting/roosting and foraging habitat as long as there is a dense canopy cover. Treatments will affect habitat in these areas with the removal of individual or groups of trees, leaving small openings that goshawks could potentially use for hunting. When nest sites are discovered in the planning area, design features will be applied providing protection of habitat directly around occupied nest sites from disturbance during operations, protections to the Post Fledging Area, and maintaining uncut areas important for foraging habitat.
	Between 40-90% and ≥35% DHC and advanced regeneration above mean snow depth	• Salvage of dead and dying. • Follow uneven aged management prescriptions in areas where mortality is lower.	Treatments are expected to further decrease canopy cover, stand density and coarse woody debris which are important habitat elements for prey species. Design features will help ensure maintenance of snags and retention of down woody debris and

Stand Condition	Overstory Mortality Level	Treatment	Effects to Goshawk Habitat
		• Remove live trees that pose a blow down risk. • Maximum removal is 40% of present stocking within residual stand to maintain wind "firmness".	maintenance of a suitable understory for various prey species across the landscape.
	Between 40% and 90% and <35%DHC	• Salvage of dead and dying. • Follow uneven aged management prescriptions in areas where mortality is lower. • Remove live trees that pose a blow down risk. • Maximum removal is 40% of present stocking within residual stand to maintain wind "firmness".	Treatments will decrease canopy cover, stand density and coarse woody debris which may also degrade habitat for prey species (particularly birds). Goshawks are not likely to use areas where treatments significantly reduce canopy cover. Design features will help ensure maintenance of snags and retention of down woody debris and maintenance of a suitable understory for various prey species across the landscape.
	>90% and ≥35% DHC and advanced regeneration above mean snow depth or >90% and <35%DHC	• Stand no longer two storied due to dead overstory. • Salvage of dead and dying spruce-fir.	These stands may not be used by goshawks due to the lack of canopy cover, live trees, and prey species because of high mortality in the stands. Treatments will not affect nesting goshawks. Design features will help ensure maintenance of snags and retention of down woody debris and maintenance of a suitable understory for various prey species across the landscape.
Multiple Canopies	<40% ≥35% DHC and advanced regeneration above mean snow depth	• Individual tree selection or group selection in 0.25 to 2 acre openings. • Removal focused on pockets of dead and dying spruce-fir.	Spruce fir is not a preferred habitat type for goshawks for nesting/roosting however these stands may provide suitable habitat if canopy cover is >40% and large trees occur in the stand. They can be used as foraging habitat for goshawks and treatments may have beneficial effects to prey species in the long term by increasing vegetation diversity. At a landscape level, these stands are expected to continue to support foraging habitat and possibly nesting/roosting habitat.

Stand Condition	Overstory Mortality Level	Treatment	Effects to Goshawk Habitat
	<40% and <35%DHC	• Individual tree selection or group selection in 0.25 to 2 acre openings. • Removal focused on pockets of dead and dying spruce-fir.	These stands are suitable foraging habitat and treatments may degrade habitat with the removal of individual or groups of trees resulting in decreases in canopy cover, stand density and coarse woody debris which are important habitat elements for prey species. Small openings may benefit some small mammal species.
	Between 40 and 90% and ≥35% DHC and advanced regeneration above mean snow depth	• Salvage of dead and dying. • Follow uneven aged management prescriptions in areas where mortality is lower. • Remove live trees that pose a blow down risk. • Maximum removal is 40% of present stocking within residual stand to maintain wind "firmness".	Large portions of these stands may be low quality foraging habitat due to the low canopy cover and stand density as a result of mortality within stands. High mortality and lack of live overstory trees may result in low prey species availability (birds). Patches of suitable foraging habitat may exist and treatments will reduce canopy cover, stand density, coarse woody debris and understory vegetation components which may degrade prey species habitat and decrease the amount of available prey. Design features will help ensure maintenance of snags and retention of down woody debris and maintenance of a suitable understory for various prey species across the landscape.
	Between 40 and 90% and <35%DHC	• Salvage of dead and dying. • Follow uneven aged management prescriptions in areas where mortality is lower. • Remove live trees that pose a blow down risk. • Maximum removal is 40% of present stocking within residual stand to maintain wind "firmness".	Canopy cover is likely to average less than 40% because of mortality levels, but pockets of suitable habitat may be present. Treatments may degrade habitat with the removal of trees and decreases in canopy cover, stand density, coarse woody debris and understory habitat components. Prey species may decrease which affect forage availability for goshawks. Overall, these areas will not support high quality habitat. Design features will help ensure maintenance of snags and retention of down woody debris and maintenance of a suitable understory for various prey species across the landscape.
	>90% ≥35% DHC and advanced	• If two canopies still alive, it is a multi-storied stand. • Salvage of dead and dying.	These stands are unlikely to be used by goshawks due to the lack of canopy cover and live trees as a result of the high mortality in the stands. Treatments will not affect nesting goshawks. Design features will help ensure maintenance of snags and retention of down woody

Stand Condition	Overstory Mortality Level	Treatment	Effects to Goshawk Habitat
	regeneration above mean snow depth or >90% and <35%DHC		debris and maintenance of a suitable understory for various prey species across the landscape.

Flammulated Owl

Direct effects to owls include noise disturbance and smoke associated with prescribed fire activities. Noise disturbance resulting from the use of heavy equipment, chainsaws and personnel implementing the project as well as smoke may cause the temporary displacement of roosting owls. Project activities will also remove suitable habitat which could result in the permanent displacement of owls if they are using areas where pockets of trees are removed.

Flammulated owls do not typically nest in spruce-fir forests, but they have been documented in mixed conifer and aspen-Douglas fir mixed stands on the GMUG NF. Treatments in spruce-fir forest stands are not expected to affect flammulated owl nesting habitat. Noncommercial prescribed fire and mechanical treatments could cause reductions in nesting habitat or cause nest abandonment and chick mortality if implemented during the nesting season in occupied areas. Indirect effects to flammulated owls and their habitat are described in Table 17.

Purple Martin

The purple martin prefers mature aspen with nearby water sources as their primary habitat. Direct effects to purple martins include noise disturbance associated with the use of heavy equipment and chainsaws and the presence of personnel during treatment activities. All of these effects may cause individuals in the area to temporarily displace to adjacent areas. Displacement of individuals during the breeding season may result in nest abandonment. It may also affect nest success if birds are spending more time avoiding activities rather than foraging and delivering food to chicks.

Table 17 includes effects of aspen treatments to martin habitat based on suckering potential and treatment prescriptions. All treatments will result in a temporary loss of habitat, unless areas with known martin occurrences can be avoided as described in design feature WFRP-22 (Appendix C of this report). Aspen will regenerate over time and habitat will be restored in the long term. Mixed conifer-aspen stands that are not treated to remove conifer encroachment will become conifer-dominated, resulting in a loss of aspen habitat. Resiliency treatments in mixed conifer-aspen stands, where appropriate to achieve desired future conditions, have the primary objective of conifer removal to maintain the aspen component. All action alternatives for aspen will help maintain aspen habitat in the long-term for martins.

Table 17. Effects of Silvicultural Treatments to Northern Goshawks, Flammulated Owls, Purple Martin in Aspen Stands.

Aspen Stand Condition	Suckering Potential	Treatment	Effects
No SAD or <50% SAD in stands	High	• Coppice (clear cut) treatments of aspen if tree defect is low to high. • Prescribed burn feasible if there is a moderate fine fuel component.	Coppice treatments in stands will result in short-term loss of habitat for goshawks, flammulated owls and purple martin. Where prescribed burning is applied, fuel loads will be reduced including downed logs, grasses, shrubs, snags and live mature trees. Breeding habitat would initially be lost but in the long term treatments are intended to stimulate aspen regeneration and persist on the landscape, maintaining habitat for all species utilizing this tree type.
	Low	• No treatment	No treatment, therefore no effect.
>50% SAD in stands.	High	• Site specific prescriptions to be determined based on site conditions.	Habitat may be degraded or lost if stands are thinned or if coppice treatments are used. Typically, these are low priority treatment areas since regeneration of the stand has shown to have low success.
	Low	• Allow continued succession of stand. • Plant site adapted conifer species as an option.	Stands will not support suitable habitat if conifers become the dominant species.
Aspen Overstory with Spruce Fir Understory	High	• Defer aspen cut and allow stand to succeed as a spruce-fir dominated stand.	Coppice treatments will temporarily result in a loss of habitat. Over time, aspen are expected to regenerate and will support aspen dependent species.

	Low	• Coppice (clear cut) treatments of aspen if tree defect is low to high. • Prescribed burn to stimulate aspen where appropriate. • Remove fir and aspen to stimulate additional aspen.	Stands will continue to support aspen and provide habitat for goshawks, flammulated owls and martins.
Mixed Conifer with Aspen	High	• Remove spruce-fir and allow stand to succeed as an aspen dominated stand. • Use prescribed fire as needed to reduce fuels and regenerate aspen.	Treatments in stands will include coppice cuts in patches across entire stands. This will result in a temporary loss of habitat. Aspen will regenerate over time and once stands are re-established, will provide suitable habitat for goshawk, flammulated owl and martins.
	Low	• Coppice (clear cut) treatments in patches within the entire stand. • Pile burn as needed. • Use prescribed fire as needed to reduce fuels and regenerate aspen	The removal of spruce-fir in stands will allow aspen to become the dominant tree species in these stands. This will also improve habitat conditions for species using pure or aspen-dominated stands as habitat.

Boreal Owl

Individuals may temporarily avoid impacted areas during project implementation due to the presence of humans, equipment, smoke and increased noise. This could cause nest abandonment if they are using these areas as nesting habitat, or could affect nest success if birds spend more time avoiding these disturbances rather than foraging and delivering food to chicks.

Noise disturbance resulting from the use of heavy equipment, chainsaws and personnel implementing the project as well as smoke may cause the temporary displacement of roosting owls. Project activities will also remove suitable habitat which could result in the permanent displacement of owls if they are using areas where pockets of trees are removed.

The proposed action will reduce ground and surface fuels through the removal of dead and dying trees. Prescribed fire treatments such as pile burning will also reduce fuels generated by treatment activities. These activities could cause reductions in prey availability for boreal owls.

Indirect effects to spruce fir habitat for boreal owl are included in Table 18. Treatments proposed in aspen stands are not expected to affect boreal owls.

Olive-sided Flycatcher

Individuals may temporarily avoid impacted areas during project implementation due to the presence of humans, equipment, smoke and increased noise. This could cause nest abandonment if they are using these areas as nesting habitat, or could affect nest success if birds spend more time avoiding these disturbances rather than foraging and delivering food to chicks.

Indirect effects include changes in habitat structure and composition within all treatment units. Salvage logging, by reducing snag densities, may diminish site quality particularly if larger snags, which olive-sided flycatchers prefer (Altman and Sallabanks 2000, Brandy 2001), are selectively removed. However, this species has been found to nest in logged forests, but not in clear cuts (Kotliar 2007). There are studies that have found that logged areas provide nesting habitat, however there is conflicting evidence as to the relative suitability of these areas (Kotliar and Melcher 1998, Hutto and Young 1999). In studies comparing burned forests with logged forests, results have shown both higher and lower nesting success in burned areas (Smucker and Smucker 2001, Meehan and George 2003). Studies have also shown that logged areas likely provide better forage than burned areas based on higher feeding rates (Meehan and George 2003). This was even found in studies where burned areas had higher nesting success than logged areas (Meehan and George 2003). Based on all of this information, disturbance events including logging activities do not necessarily result in negative impacts to olive sided flycatchers. What isn't known is whether it's the type of disturbance, the scale, severity, or elapsed time since the disturbance occurred that affects habitat suitability (Kotliar 2007). Maintaining clumps of trees and snags are important to maintaining nesting habitat for flycatchers. The proposed project includes design features that will maintain these elements in areas where salvage activities occur. This will help to minimize adverse effects to flycatchers. A description of indirect effects to habitat due to silvicultural treatments is described in Table 18.

The proposed action will also reduce ground and surface fuels through the removal of dead and dying trees. Prescribed fire treatments such as pile burning will also reduce fuels generated by treatment activities. Olive sided flycatchers do utilize burned areas and have been found to be more abundant in moderate to high severity burned areas than in low severity burned areas.

Therefore, the reduction of fuels prior to a fire occurring may result in habitat that is of lower quality. However, if a stand replacing fire occurs, it is unlikely flycatchers would use the area especially in the absence of any live trees in or near these areas. Initially, portions of crown fire patches much greater than 200 m from live forest may not be readily used by olive-sided flycatchers, due to lack of nearby trees that retain needles (Kotliar 2007). Over longer time frames, delayed forest regeneration within the interior of severely burned patches may prolong occupancy of the burn by olive-sided flycatchers (Kotliar 2007).

Pygmy Shrew

Direct effects to pygmy shrews could potentially include trampling and crushing due to the use of heavy equipment and the increases presence of humans. There are no recorded observations of individuals in areas available for treatment however this species is small and not easily detected due to their small size (they are the smallest North American mammal and one of the smallest mammals in the world) and they spend a lot of time digging through soil and leaf litter searching for food. Indirect effects to habitat are described in more detail in Table 18. Pygmy shrews do not use aspen as habitat and treatments to aspen stands will have no effect to them.

The proposed action will reduce ground and surface fuels through the removal of dead and dying trees. Prescribed fire treatments such as pile burning will also reduce fuels generated by treatment activities. Although recorded to live in areas with both wet and dry soil, the pygmy shrew requires moist soils and a moist leaf litter layer when foraging for insects (*Index for Mammalian Species. www.science.smith.edu. Retrieved 2016-01-16*). Though small, they have an extremely large appetite for their size and due to a fast metabolism, they need to eat constantly. Treatments that reduce woody material on the ground and that reduce shade from overstory tree removal are likely to result in dryer conditions that could negatively impact pygmy shrew foraging habitat.

Table 18. Effects of Silvicultural Treatments in Spruce Fir to Boreal Owl, Olive sided Flycatcher, and Pygmy Shrew

Stand Condition	Overstory Mortality Level	Treatment	Effects to Habitat
Single Storied	<40%	• Individual tree selection. • Removal focused on pockets of dead and dying spruce-fir. • Harvest 15-25% of stand. • May require mechanical site prep.	Treatments will slightly alter habitat conditions for the boreal owl, olive sided flycatcher and pygmy shrew. Open pockets will occur within stands and stand density will slightly decrease in some areas which may improve foraging habitat for flycatchers. Overall stands will continue to provide suitable habitat across the landscape.
	Between 40-90%	• Remove all dead and dying spruce-fir in areas where adequate seed source exists. • Group selection where mortality is patchy. • Clear cut where mortality is extensive. • Create small openings in areas where <40% mortality occurs. • Maximum removal is 40% of present stocking within residual stand to maintain wind "firmness". • May require mechanical site prep.	Habitat for all of these species may be degraded or lost as a result of treatment activities. There will be a decrease in canopy cover, stand density, and coarse woody debris with group selection treatments. This may degrade habitat for the pygmy shrew as well as habitat for boreal owl prey species resulting in a decrease in prey availability. Design features will minimize effects to coarse woody debris levels which will retain some habitat components for small mammal species. Decrease or loss of canopy cover and stand density may degrade the quality of habitat for all species. Flycatchers may continue to utilize the area if there are snags and patches of live trees remaining. A design feature that requires retaining 90-225 snags per 100 acres across the landscape will maintain habitat for the owl and flycatcher. Design features will retain live trees in salvaged areas and patches of high quality lynx foraging habitat in blocks greater than 0.3 acres or larger should provide standing snags and understory habitats for birds. Maintaining understory vegetation should provide thermal cover for shrews.
	>90%	• Remove all dead and dying spruce-fir where there is no adequate natural seed source. • Clear cut where mortality is extensive. • May require mechanical site prep.	These stands provide low quality to marginal habitat for all of the species analyzed in this table. Treatments will decrease or remove canopy cover, stand density and coarse woody debris as well as an incidental reduction in understory vegetation within treated areas. Treatments will be designed to maintain patches of habitat greater than 0.3 acres to support high quality lynx foraging habitat, which will also provide habitat for pygmy shrew (will help maintain moist conditions through retention of leaf litter associated with these patches) and boreal owl prey species but they will have limited use

Stand Condition	Overstory Mortality Level	Treatment	Effects to Habitat
			due to their small size. Within treatment areas, these stands will no longer support suitable habitat for any of the species and it will take years (decades) for suitable habitat to regenerate. Design features will maintain suitable habitat for boreal owls, flycatchers and shrews across the broader landscape where treatments are proposed.
Two Storied	<40% and ≥35% DHC and advanced regeneration above mean snow depth	• Individual tree selection or group selection in 0.25 to 2 acre openings. • Removal focused on pockets of dead and dying spruce-fir.	Treatments will slightly alter habitat conditions for the boreal owl, olive sided flycatcher and pygmy shrew. Open pockets will occur within stands and stand density will slightly decrease in some areas which will improve foraging habitat for flycatchers. Stands will continue to provide suitable habitat for all species across the landscape. Habitat quality for small mammal prey species is expected to improve due to increased diversity that these treatment types will achieve in the long term. Distribution of prey for boreal owls may be affected, but small mammal populations will not result in any significant change. Treatments are intended to make stands more resilient to future bark beetle attacks which will decrease the chances of habitat loss in the future.
	<40% and <35%DHC	• Individual tree selection or group selection in 0.25 to 2 acre openings. • Remove dead and dying spruce-fir.	Treatments will slightly alter habitat conditions for boreal owl, olive-sided flycatcher and pygmy shrew. Open pockets will occur within stands and stand density will slightly decrease in some areas which will continue to provide suitable foraging habitat for flycatchers. Habitat for small mammal species is marginal quality due to relatively low vegetation structural diversity. Treatments may further degrade habitat for these species with a decrease and loss of canopy cover and stand density. These changes would result in loss or degradation of habitat for shrews and other small mammals that are prey for boreal owls. Design features for coarse woody debris and snag retention will retain some of those features maintaining some habitat in stands after treatments. Small patches of habitat within the forest matrix would be lost or degraded with the group selection prescription, reducing habitat availability for boreal owl and pygmy shrew. Treatments are intended to increase age class diversity and tree species composition making stands more resilient to future bark beetle attacks which will decrease the chances of habitat loss in the future.

Stand Condition	Overstory Mortality Level	Treatment	Effects to Habitat
	Between 40-90% and ≥35% DHC and advanced regeneration above mean snow depth	• Salvage of dead and dying. • Follow uneven aged management prescriptions in areas where mortality is lower. • Remove live trees that pose a blow down risk. • Maximum removal is 40% of present stocking within residual stand to maintain wind "firmness".	Habitat for all of these species may be degraded or lost as a result of treatment activities. There will be a decrease in canopy cover, stand density, and coarse woody debris with group selection treatments. This may degrade habitat for the pygmy shrew as well as habitat for boreal owl prey species resulting in a decrease in prey availability. Design features will minimize effects to coarse woody debris levels which will retain some habitat components for small mammals. Decreases in canopy cover and stand density may degrade the quality of habitat for all species. A design feature that requires retaining 90-225 snags per 100 acres across the landscape will maintain this habitat component for the owl and flycatcher. Thermal cover may be affected by treatment activities for the shrew, but it will depend on the remaining understory. However, design features will help ensure retention of habitat for boreal owls, flycatchers and shrews across the broader landscape even though it may be of lower quality due to high overstory tree mortality.
	Between 40% and 90% and <35%DHC	• Salvage of dead and dying. • Follow uneven aged management prescriptions in areas where mortality is lower. • Remove live trees that pose a blow down risk. • Maximum removal is 40% of present stocking within residual stand to maintain wind "firmness".	Habitat for all of these species is low quality and may be degraded further with salvage activities. All activities will lower the amount of coarse woody debris in stands which will affect shrews and small mammals that are prey for boreal owls. Design features will minimize effects to coarse woody debris levels and retain snags across the landscape which will maintain some habitat. Changes and loss of canopy cover and stand density may degrade the quality of habitat for all species. Because mortality is between 40% and 90%, untreated stands will likely be left with patches of low quality habitat in the matrix that may not be of sufficient size to support high densities of boreal owl across the broader landscape. However, Design features will help ensure retention of habitat for boreal owls, flycatchers and shrews across the broader landscape even though it may be of lower quality due to high overstory tree mortality and removal from salvage harvests.

Stand Condition	Overstory Mortality Level	Treatment	Effects to Habitat
	>90% and ≥35% DHC and advanced regeneration above mean snow depth or >90% and <35%DHC	• Stand no longer two storied due to dead overstory. • Salvage of dead and dying spruce-fir.	These stands are unlikely to support suitable habitat for the boreal owl or flycatchers. Due to the amount of mortality in the stand, canopy cover and stand density would already be absent or low and highly degraded. Habitat for shrews may still occur if there is a developed understory that can provide cover, shelter and food. Treatments may further degrade any suitable habitat that remains and it is likely treatment areas will not support these species until forest cover regenerates and reaches adequate sizes and densities. However, design features will help ensure retention of habitat for boreal owls, flycatchers and shrews across the broader landscape even though it may be of lower quality due to high overstory tree mortality and removal from salvage harvests.
Multiple Canopies	<40% ≥35% DHC and advanced regeneration above mean snow depth	• Individual tree selection or group selection in 0.25 to 2 acre openings. • Removal focused on pockets of dead and dying spruce-fir.	Treatments will slightly alter habitat conditions for the boreal owl, olive sided flycatcher and pygmy shrew. Open pockets will remain after treatments within stands and stand density will slightly decrease in some areas and may improve foraging habitat for flycatchers. Stands will continue to provide suitable habitat across the landscape for all species especially in areas where more than one story remains. Habitat for small mammal species will also be affected in patches, but populations for shrews and prey species for the boreal owl are not expected to result in any significant change to populations. Treatments are intended to increase age class diversity and tree species composition making stands more resilient to future bark beetle attacks which will decrease the chances of more habitat loss in the future.

Stand Condition	Overstory Mortality Level	Treatment	Effects to Habitat
	<40% and <35%DHC	• Individual tree selection or group selection in 0.25 to 2 acre openings. • Removal focused on pockets of dead and dying spruce-fir.	Treatments will slightly alter habitat conditions for boreal owl, olive-sided flycatcher and pygmy shrew. Open pockets will occur within stands and stand density will slightly decrease in some areas which may improve foraging habitat for flycatchers. Habitat for small mammal species is moderate quality due to less understory cover. Treatments may further degrade habitat for these species, however existing DHC will be retained as much as possible. Coarse woody debris would also be decreased which will impact the pygmy shrew and other small mammal species by reducing important habitat components for these species. This may also affect the prey base for boreal owls by changing the distribution across the landscape. Design features require the retention of coarse woody debris which will maintain that habitat component in stands after treatments. There will be a decrease in canopy cover and stand density but some areas may still maintain more than one story. Patches of habitat may be lost or degraded with the group selection prescription. Treatments are intended to increase age class diversity and tree species composition making stands more resilient to future bark beetle attacks which may benefit these species in the long term.
	Between 40 and 90% and ≥35% DHC and advanced regeneration above mean snow depth	• Salvage of dead and dying. • Follow uneven aged management prescriptions in areas where mortality is lower. • Remove live trees that pose a blow down risk. • Maximum removal is 40% of present stocking within residual stand to maintain wind "firmness".	Habitat for all of these species may be degraded or lost as a result of treatment activities. There will be a decrease in canopy cover, stand density, and coarse woody debris with group selection treatments. This may degrade habitat for the pygmy shrew as well as habitat for boreal owl prey species resulting in a decrease in prey availability. Design features will minimize effects to coarse woody debris levels and retain snags across the landscape which will maintain some habitat components for all species. Salvage treatments will likely cause losses of habitat with the removal of canopy cover and stand density. Thermal cover may be affected by treatment activities for the shrew, but it will depend on the remaining understory and retention of course woody debris. Design features will help ensure retention of habitat for boreal owls, flycatchers and shrews across the broader landscape even though it may be of lower quality due to high overstory tree mortality and removal from salvage harvest.

Stand Condition	Overstory Mortality Level	Treatment	Effects to Habitat
	Between 40 and 90% and <35%DHC	• Salvage of dead and dying. • Follow uneven aged management prescriptions in areas where mortality is lower. • Remove live trees that pose a blow down risk. • Maximum removal is 40% of present stocking within residual stand to maintain wind "firmness".	Habitat for all of these species is low quality and may be degraded or lost as a result of treatment activities. Salvage harvest will remove canopy cover and stand density in treatment units while other prescriptions will cause reduce habitat quality but not cause complete removal. All activities will lower the amount of coarse woody debris in stands which will affect shrews and small mammals that are prey for boreal owls. Design features will minimize effects to coarse woody debris levels which will maintain some habitat. Decreases and loss of canopy cover and stand density may degrade the quality of habitat for all species and because mortality is between 40% and 90%, stands will likely be left with patches of low quality habitat that may not be large enough to support boreal owls within treatment areas. However, design features will help ensure retention of habitat for boreal owls, flycatchers and shrews across the broader landscape even though it may be of lower quality due to high overstory tree mortality and removal from salvage harvest.
	>90% ≥35% DHC and advanced regeneration above mean snow depth or >90% and <35%DHC	• If two canopies still alive, it is a multi-storied stand. • Salvage of dead and dying.	These stands are unlikely to support suitable habitat for the boreal owl and nesting habitat for flycatchers except in cases where more than one story exists. Under those conditions, habitat would be low quality due to the amount of mortality in the stand. Canopy cover and stand density would already be low and highly degraded due to the extensive mortality. Flycatcher habitat may be available but it would be marginal at best and likely in patches. Habitat for shrews may still occur if there is a developed understory that can provide food, cover, and shelter. Treatments may further degrade any suitable habitat that remains. We expect that remaining stands would be marginal habitat patches; it is likely treatment areas will not support these species until forest cover regenerates and reaches adequate sizes and densities. However, design features will help ensure retention of habitat for boreal owls, flycatchers and shrews across the broader landscape even though it may be of lower quality due to high overstory tree mortality and removal from salvage harvest.

Hoary Bat

Direct effects to hoary bat include the potential for removal of occupied roost trees which could result in injury, death or displacement of individuals. If individuals are roosting in the immediate vicinity of the project area they may be disturbed by the noise or vibration caused by heavy equipment, the use of chainsaws and smoke resulting from project activities. This could result in temporary displacement of individuals. Impacts resulting from displacement or potential for mortality would be greatest during the maternity and the winter roosting seasons. Roosting habitat will be degraded in the salvage of spruce-fir stands and the proposed project does include a design feature that maintains 90-225 snags/100 acres across the landscape. This design feature will retain some snags, thus maintaining roosting habitat for bats. The largest diameter snags will be maintained and they will be in clumps where possible.

There may be an increased risk of predation if individuals are displaced and unable to locate suitable alternate roosting habitat. Also, vegetation treatments will modify foraging habitat, however it will not remove or decrease the amount of available foraging habitat. The proposed project may benefit hoary bats and their habitat in the long term by restoring and improving resiliency of spruce-fir stands against future bark beetle infestations, and promoting regeneration. This will occur through a combination of removing dead and dying trees (salvage harvest), retaining existing live, healthy trees and planting seedlings (reforestation) in areas where stocking levels are not adequate. Retained live trees that reproduce will hopefully result in trees that are more resilient to future bark beetle attacks.

American Marten

Direct effects to American marten are likely to occur primarily where treatments are impacting spruce-fir and spruce-aspen mixed stands. Individuals may abandon the area temporarily during project implementation due to the presence of humans, equipment and increased noise. Project activities will also remove suitable habitat or reduce habitat quality. Tables 19-21 quantifies suitable marten habitat on the GMUG NF that may be affected by the action alternatives. Appendix A (Figure A-5 and A-6) of this report contains maps identifying areas of potentially affected marten habitat by Alternatives 2 and 3.

Table 19. Activities proposed under alternative 2 – overlap with American marten habitat (acres) within each Geographic Area (see Appendix A; Figure A-5 of this report)

Geographic Area	American Marten Habitat?	Hazard Trees	New Roads Outside PTA	Priority Treatment Area (PTA)					PTA Total	Grand Total[1]
				Noncommercial		Commercial				
				Burn and Mechanical	Mechanical	Combination	Resiliency	Salvage		
Grand Mesa	Denning and Resting	267	2	1,043		5,602	2,898	261	9,804	**10,072**
	Foraging	60	2	1,448		2,263	1,582	188	5,481	**5,543**
	Not Marten Habitat	748	15	19,430	1,445	943	1,683	36	23,537	**24,301**
	Total	**1,075**	**19**	**21,920**	**1,445**	**8,808**	**6,163**	**486**	**38,822**	**39,916**
Gunnison Basin North	Denning and Resting	817	8	5,990		3,263	1,392	1,026	11,671	**12,497**
	Foraging	151	2	659		1,359	657	361	3,037	**3,191**
	Not Marten Habitat	2,727	39	41,736		2,275	4,615	437	49,063	**51,828**
	Total	**3,696**	**49**	**48,386**		**6,897**	**6,663**	**1,825**	**63,771**	**67,516**
Gunnison Basin South	Denning and Resting	552	5	2,943		2,580	548	1,904	7,976	**8,533**
	Foraging	150	3	1,238		2,363	290	2,475	6,366	**6,519**
	Not Marten Habitat	4,091	37	14,319		6,391	3,580	7,683	31,973	**36,101**
	Total	**4,794**	**44**	**18,500**		**11,334**	**4,419**	**12,061**	**46,315**	**51,152**
North Fork Valley	Denning and Resting	296	2	7		1,326	880	203	2,415	**2,713**
	Foraging	76	2	0		484	339	195	1,018	**1,096**
	Not Marten Habitat	1,885	21	12,218	920	1,547	3,806	146	18,636	**20,542**
	Total	**2,258**	**25**	**12,225**	**920**	**3,356**	**5,025**	**544**	**22,070**	**24,352**
San Juans	Denning and Resting	635	11	79		2,830	88	683	3,681	**4,326**
	Foraging	68	8	204		2,494	75	1,052	3,825	**3,902**
	Not Marten Habitat	1,320	23	147		2,448	2,431	95	5,122	**6,464**
	Total	**2,023**	**42**	**430**		**7,773**	**2,595**	**1,830**	**12,628**	**14,692**
Uncompahgre Plateau	Denning and Resting	171	1	1,163		6,417	2,334	165	10,078	**10,250**
	Foraging	50	1	215		4,491	1,669	107	6,482	**6,533**
	Not Marten Habitat	3,321	33	39,853		4,089	13,631	85	57,658	**61,011**
	Total	**3,542**	**34**	**41,231**		**14,997**	**17,634**	**357**	**74,219**	**77,795**
	Grand Total	**17,387**	**213**	**142,691**	**2,365**	**53,166**	**42,499**	**17,103**	**257,823**	**275,424**

[1]There are a total of 275,424 acres where proposed activities under Alternative 2 could occur. Of those acres, 48,392 acres (17.6%) are in marten denning/resting habitat, and 26,784 acres (9.7%) are in marten foraging habitat. Prior to implementation, field surveys would verify where suitable habitat occurs in project areas and appropriate design features would be applied to protect occupied areas and manage marten habitat based on best available science (USFS 2015). This analysis represents the maximum area where activities could potentially occur spatially and temporally during the life of the project (8 - 12 years). During the life of the project, these proposed activities have the potential to affect up to 12.7% of the total denning/resting habitat and up to 13% of the total foraging habitat on the GMUG National Forests.

Table 20. Activities proposed under alternative 3 – overlap with American marten habitat (acres) within each Geographic Area (see Appendix A; Figure A-6 of this report).

Geographic Area	American Marten Habitat?	Hazard Trees	New Roads Outside PTA	Priority Treatment Area (PTA)					PTA Total	Grand Total[1]
				Noncommercial		Commercial				
				Burn and Mechanical	Mechanical	Combination	Resiliency	Salvage		
Grand Mesa	Denning and Resting	467	6	752		3,474	1,722	188	6,135	**6,608 (22%)**
	Foraging	163	9	1,121		1,252	761	169	3,303	**3,475 (12%)**
	Not Marten Habitat	887	14	15,437	1,445	558	1,122	18	18,580	**19,481 (66%)**
	Total	**1,516**	**28**	**17,310**	**1,445**	**5,283**	**3,605**	**376**	**28,018**	**29,563**
Gunnison Basin North	Denning and Resting	1,110	8	4,602		1,017	566	521	6,707	**7,825 (17%)**
	Foraging	285	3	334		427	188	175	1,124	**1,412 (3%)**
	Not Marten Habitat	3,846	34	30,645		542	1,490	35	32,712	**36,592 (80%)**
	Total	**5,241**	**45**	**35,581**		**1,986**	**2,245**	**732**	**40,544**	**45,829**
Gunnison Basin South	Denning and Resting	979	3	1,209		792	240	392	2,633	**3,615 (19%)**
	Foraging	398	2	170		310	130	524	1,134	**1,534 (8%)**
	Not Marten Habitat	6,036	14	5,912		535	629	344	7,419	**13,469 (72%)**
	Total	**7,413**	**20**	**7,291**		**1,637**	**999**	**1,259**	**11,187**	**18,619**
North Fork Valley	Denning and Resting	364	2	5		721	683	46	1,455	**1,821 (9%)**
	Foraging	125	1			194	301	10	505	**632 (3%)**
	Not Marten Habitat	2,327	17	9,472	897	846	3,309		14,525	**16,869 (87%)**
	Total	**2,816**	**20**	**9,477**	**897**	**1,761**	**4,293**	**56**	**16,485**	**19,322**
San Juans	Denning and Resting	698	8	79		1,520	77	306	1,981	**2,687 (34%)**
	Foraging	143	10	204		819	40	345	1,408	**1,561 (20%)**
	Not Marten Habitat	1,676	5	147		798	959	0	1,905	**3,585 (46%)**
	Total	**2,516**	**22**	**430**		**3,137**	**1,076**	**652**	**5,294**	**7,833**
Uncompahgre Plateau	Denning and Resting	454	4	886		4,216	850	128	6,080	**6,537 (12%)**
	Foraging	271	3	170		2,914	978	53	4,114	**4,389 (8%)**
	Not Marten Habitat	4,467	27	32,347		1,636	6,057	37	40,077	**44,571 (80%)**
	Total	**5,192**	**34**	**33,403**		**8,766**	**7,886**	**218**	**50,272**	**55,497**
	Grand Total	**24,694**	**169**	**103,491**	**2,342**	**22,571**	**20,103**	**3,293**	**151,800**	**176,662**

[1]There are a total of 176,662 acres where proposed activities under Alternative 3 could occur. Of those acres, 29,093 acres (16.5%) are in marten denning/resting habitat, and 13,002 acres (7.4%) are in marten foraging habitat. Prior to implementation, field surveys would verify where suitable habitat occurs in project areas and appropriate design features would be applied to protect occupied areas and manage marten habitat based on best available science (USFS 2015). This analysis represents the maximum area where activities could potentially occur spatially and temporally during the life of the project (8 - 12 years). During the life of the project, these proposed activities have the potential to affect up to 7.6% of the total denning/resting habitat and up to 6.3% of the total foraging habitat on the GMUG National Forests.

Table 21. Comparison of Alternatives 2 and 3 to the Baseline – Potentially affected American marten habitat (acres) within each Geographic Area.

Geographic Area	Alt. 2 Potentially Affected Areas[1]	Alt. 3 Potentially Affected Areas	Marten Habitat (Baseline)[2]			Marten Habitat Potentially Affected by Alt. 2 (% of Total Habitat)						Marten Habitat Potentially Affected by Alt. 3 (% of Total Habitat)					
			Denning/Resting	Foraging	Grand Total	Denning/Resting		Foraging		Grand Total		Denning/Resting		Foraging		Grand Total	
Grand Mesa	39,916	29,563	47,930	28,282	76,212	10,072	(21)	5,543	(20)	15,615	(20)	6,608	(14)	3,475	(12)	10,083	(13)
Gunnison Basin North	67,516	45,829	144,948	49,919	194,867	12,497	(9)	3,191	(6)	15,688	(8)	7,825	(5)	1,412	(3)	9,237	(5)
Gunnison Basin South	51,152	18,619	72,962	34,343	107,305	8,533	(12)	6,519	(19)	15,052	(14)	3,615	(5)	1,534	(4)	5,149	(5)
North Fork Valley	24,352	19,322	39,729	30,681	70,410	2,713	(7)	1,096	(4)	3,809	(5)	1,821	(5)	632	(2)	2,453	(3)
San Juans	14,692	7,833	50,685	51,304	101,989	4,326	(9)	3,902	(8)	8,228	(8)	2,687	(5)	1,561	(3)	4,248	(4)
Uncompahgre Plateau	77,795	55,497	24,513	10,321	34,834	10,250	(42)	6,533	(63)	16,783	(48)	6,537	(27)	4,389	(43)	10,926	(31)
Grand Total	**275,423**	**176,663**	**380,767**	**204,850**	**585,617**	**48,391**	**(13)**	**26,784**	**(13)**	**75,175**	**(13)**	**29,093**	**(8)**	**13,003**	**(6)**	**42,096**	**(7)**

[1]Potentially affected areas: includes all commercial and noncommercial activities in Priority Treatment Areas, hazard tree removal areas, and area affected by new roads outside PTAs.

[2]This is all modeled American marten denning/resting and foraging habitat for the GMUG National Forests based on the GMUG 2005 MIS Assessment (http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5199823.pdf)

Snags and large woody debris, especially in the form of large-diameter boles, is an important feature of marten habitat. Logs are most useful to martens for gaining access to subnivean areas and for resting. Removal of large (coarse) woody debris from forests or interfering with processes that make it available in suitable sizes and stages of decay by removing standing trees and snags may indirectly affect martens by reducing habitat quality. While reductions of this important component of marten habitat may reduce habitat quality directly within the units, the project design features will help to maintain suitable marten habitat components consistent with Forest Plan direction. Indirect effects based on silvicultural treatments in spruce-fir stands are summarized in Table 22. Marten are not found in aspen-dominated stands so aspen treatments will not affect martens or their habitat except where treatments occur in mixed conifer-aspen stands.

Table 22. Effects of Silvicultural Treatments to Marten in Spruce - Fir Stands

Stand Condition	Overstory Mortality Level	Treatment	Effects to Martens
Single Storied	<40%	• Individual tree selection. • Removal focused on pockets of dead and dying spruce-fir. • Harvest 15-25% of stand. • May require mechanical site prep.	Treatments will slightly alter habitat conditions with decreases to canopy cover, stand density, stand structure, coarse woody debris and understory vegetation. Open pockets will occur within stands but overall, suitable habitat will continue to exist across the landscape. Through single tree and group selection, regeneration of a spruce understory is likely to occur which will improve long-term habitat conditions for marten.
	Between 40-90%	• Remove all dead and dying spruce-fir in areas where adequate seed source exists. • Group selection where mortality is patchy. • Clear cut where mortality is extensive. • Create small openings in areas where <40% mortality occurs. • Maximum removal is 40% of present stocking within residual stand to maintain wind "firmness". • May require mechanical site prep.	Suitable habitat for marten may be degraded or lost as the level of sanitation and salvage treatments increase with increasing overstory mortality. The use of single tree and group selections in stands with relatively low overstory mortality will result in a slight decrease in canopy cover, stand density, coarse woody debris and snags. This may degrade both denning and foraging habitat. As the level of salvage increases with increasing overstory mortality, marten habitat in treated stands will experience increasing levels of impact. Design features will help retain denning and foraging habitat and habitat connectivity for marten across the broader landscape.
	>90%	• Remove all dead and dying spruce-fir where there is no adequate natural seed source. • Clear cut where mortality is extensive. • May require mechanical site prep.	These stands provide low quality to marginal habitat and treatment activities will further reduce the quality of habitat. Canopy cover, stand density, and coarse woody debris will decrease in treated stands. Due to the lack of an understory and incidental loss of the understory where it does occur, habitat will be lacking in treated stands. These stands will no longer support suitable habitat and it will take many years (decades) for suitable habitat to regenerate even with planting activities. Design features will help retain some denning and foraging habitat and habitat connectivity for marten across the broader landscape where understory components and down wood exists to support marten.

Stand Condition	Overstory Mortality Level	Treatment	Effects to Martens
Two Storied	<40% and ≥35% DHC and advanced regeneration above mean snow depth	• Individual tree selection or group selection in 0.25 to 2 acre openings. • Removal focused on pockets of dead and dying spruce-fir.	Stands currently provide suitable habitat for martens. Treatments will result in open pockets within stands and stand density and canopy cover will decrease in these areas. Stands will continue to provide suitable habitat across the landscape. The availability of forage may change, but mainly in distribution with group selection treatments due to incidental reduction in understory vegetation in these patches. Through single tree and group selection, regeneration of a spruce understory is likely to occur which will improve long-term habitat conditions for marten.
	<40% and <35%DHC	• Individual tree selection or group selection in 0.25 to 2 acre openings. • Remove dead and dying spruce-fir.	Treatments will alter habitat conditions with open pockets occurring in stands as a result of group selection tree removal. Canopy cover, stand density and snags will decrease in these patches, but overall, suitable habitat will remain. Foraging habitat is not high quality due to the low percent of DHC currently in the stands. Treatments may further degrade habitat for marten prey with incidental loss of understory vegetation and decrease in coarse woody debris. Design features for coarse woody debris and snag retention will retain some habitat features maintaining these habitat components in stands after treatments. Through single tree and group selection, regeneration of a spruce understory is likely to occur which will improve long-term habitat conditions for marten.
	Between 40-90% and ≥35% DHC and advanced regeneration above mean snow depth	• Salvage of dead and dying. • Follow uneven aged management prescriptions in areas where mortality is lower. • Remove live trees that pose a blow down risk. • Maximum removal is 40% of present stocking within residual stand to maintain wind "firmness".	Suitable habitat for marten may be degraded or lost as the level of sanitation and salvage treatments increase with increasing overstory mortality. The use of single tree and group selections in stands with relatively low overstory mortality will result in a slight decrease in canopy cover, stand density, coarse woody debris and snags. This may degrade both denning and foraging habitat. As the level of salvage increases with increasing overstory mortality, marten habitat in treated stands will experience increasing levels of impact. Design features will help retain denning and foraging habitat and habitat connectivity for marten across the broader landscape.
	Between 40% and 90% and <35%DHC	• Salvage of dead and dying.	Habitat for martens in these stands would already be low to marginal quality due to a lack of understory cover and structural diversity and may be further degraded or lost as a result of treatment activities. As

Stand Condition	Overstory Mortality Level	Treatment	Effects to Martens
		• Follow uneven aged management prescriptions in areas where mortality is lower. • Remove live trees that pose a blow down risk. • Maximum removal is 40% of present stocking within residual stand to maintain wind "firmness".	the level of sanitation and salvage treatments increase with increasing overstory mortality marten habitat in treated stands will experience increasing levels of impact. The use of single tree and group selections in stands with relatively low overstory mortality will result in a slight decrease in canopy cover, stand density, coarse woody debris and snags. This may degrade both denning and foraging habitat. As the level of salvage increases with increasing overstory mortality, marten habitat in treated stands will experience increasing levels of impact. Design features will help avoid or minimize these impacts and maintain important habitat components for marten.
	>90% and ≥35% DHC and advanced regeneration above mean snow depth or >90% and <35%DHC	• Stand no longer two storied due to dead overstory. • Salvage of dead and dying spruce-fir.	Where dead stands contain >35% DHC, habitat is likely to support martens. Where dead stands contain no understory and there are no live trees, they are unlikely to support suitable habitat for martens because of the amount of mortality in the stand. This is likely to affect prey species availability for martens (red squirrel populations are likely to be severely reduced due to lack of cone-producing trees which is a food source for squirrels). Canopy cover, stand density, and coarse woody debris will decrease in treated stands. Due to the lack of an understory and incidental loss of the understory where it does occur, habitat will be lacking in treated stands. These stands will no longer support suitable habitat and it will take years (decades) for suitable habitat to regenerate even with planting activities. Design features will help retain habitat connectivity and some denning and foraging habitat for marten across the broader landscape where understory components and down wood exists to support marten.

Stand Condition	Overstory Mortality Level	Treatment	Effects to Martens
Multiple Canopies	<40% ≥35% DHC and advanced regeneration above mean snow depth	• Individual tree selection or group selection in 0.25 to 2 acre openings. • Removal focused on pockets of dead and dying spruce-fir.	Treatments will slightly alter habitat conditions for martens and will result in open pockets within stands. Stand density will slightly decrease in some areas, but they will continue to provide suitable habitat across the landscape especially in areas where more than one story remains. Habitat for marten prey will also be affected in patches, but populations are not expected to result in any significant change. Through single tree and group selection, regeneration of a spruce understory is likely to occur which will improve long-term habitat conditions for marten.
	<40% and <35%DHC	• Individual tree selection or group selection in 0.25 to 2 acre openings. • Removal focused on pockets of dead and dying spruce-fir.	Treatments will slightly alter habitat conditions. Open pockets will occur as a result of treatments in stands and stand density will slightly decrease. Habitat for marten prey is moderate quality with the low percent of DHC in the stands. Treatments may degrade DHC and decrease coarse woody debris which will affect small mammal habitat. However existing DHC will be retained as much as possible and a design feature will maintain coarse woody debris levels minimizing habitat loss for marten prey. Prey is expected to remain available in stands. There will be a decrease in canopy cover and stand density but some areas may still maintain more than one story. Snags will also be retained at 90-225 per 100 acres. Patches of habitat may be degraded with the group selection prescription. Through single tree and group selection, regeneration of a spruce understory is likely to occur which will improve long-term habitat conditions for marten.
	Between 40 and 90% and ≥35% DHC and advanced regeneration above mean snow depth	• Salvage of dead and dying. • Follow uneven aged management prescriptions in areas where mortality is lower. • Remove live trees that pose a blow down risk. • Maximum removal is 40% of present stocking within residual stand to maintain wind "firmness".	Suitable habitat for marten may be degraded or lost as the level of sanitation and salvage treatments increase with increasing overstory mortality. The use of single tree and group selections in stands with relatively low overstory mortality will result in a slight decrease in canopy cover, stand density, coarse woody debris and snags. This may degrade both denning and foraging habitat. Habitat for marten prey may also be lost or degraded resulting in a decrease in prey availability As the level of salvage increases with increasing overstory mortality, marten habitat in treated stands may experience increasing levels of impact. Design features should retain habitat

Stand Condition	Overstory Mortality Level	Treatment	Effects to Martens
			connectivity and denning and foraging habitat for marten across the broader landscape.
	Between 40 and 90% and <35%DHC	• Salvage of dead and dying. • Follow uneven aged management prescriptions in areas where mortality is lower. • Remove live trees that pose a blow down risk. • Maximum removal is 40% of present stocking within residual stand to maintain wind "firmness".	Habitat for marten is low to moderate quality and may be degraded or lost as a result of treatment activities. Salvage treatments will remove canopy cover and stand density while other prescriptions will decrease these elements. All activities will lower the amount of coarse woody debris in stands which may degrade habitat for marten prey and may limit marten access to the subnivean layer during winter, thus reducing prey availability. Design features will minimize effects to coarse woody debris levels and impacts to DHC will be avoided where possible which will maintain some prey habitat and maintain habitat connections for marten. Marten individuals will be affected with changes in distribution and abundance of prey in stands.
	>90% ≥35% DHC and advanced regeneration above mean snow depth or >90% and <35%DHC	• If two canopies still alive, it is a multi-storied stand. • Salvage of dead and dying.	These stands are unlikely to support suitable habitat for martens, likely due to reduced prey (red squirrel populations are likely to be severely reduced due to lack of cone-producing trees which is a food source for squirrels). In cases where more than one story remains, habitat would be marginal quality because of the amount of mortality but would still provide habitat connections and support some prey species for marten (snowshoe hare, voles, birds). Canopy cover and stand density would already be absent or low and highly degraded. Habitat for marten prey may still occur if there is a developed understory that can provide food, cover, and shelter, thus prey may still remain after treatments. However, treatments may degrade any denning habitat in treatment units and it is expected only patches of marginal habitat would remain and would not support martens in the immediate future. Design features will help retain suitable denning and foraging habitat for marten across the broader landscape.

The action alternatives will reduce ground and surface fuels by removing dead and dying trees within and outside the WUI. Prescribed fire treatments such as pile burning will also reduce fuels generated by treatment activities. According to the Fuels and Air Quality Report for the SBEADMR project, when a stand replacing fire occurs in spruce fir stands, "fire behavior is high intensity crown fire, rates of spread can be fast and fire severity may be high" (USDA Forest Service 2014). The proposed action alternatives will primarily address fire risk and public safety in the WUI (and outside the WUI in Alternative 2) and make areas more defensible for firefighters, and potentially increase the ability of areas to sustain a wildfire with less risk to the public. Regardless of wildfire risk under the current condition vs. the proposed actions, treatments that reduce overstory forest cover and course woody debris in spruce-fir forests negatively impacts species such as marten that are specialists for mature or old growth interior forest conditions. Studies have shown that martens largely avoid burned over areas due to the lack of overstory cover and course woody debris on the ground (USDA Forest Service 2005). These effects would similarly occur under the commercial and non-commercial treatment scenarios proposed under SBEADMR, with salvage harvest being the most impactful to the American marten. Design features to protect and promote multi-storied spruce-fir forests, protect live trees, promote habitat connectivity, and retain snag and course woody debris will help avoid or lessen these negative effects. Resiliency treatments would negatively affect the marten in the short-term, but could have beneficial effects to habitat in the long-term if they are successful in increasing vegetation composition and structural diversity.

Effects of the WUI Alternative – Alternative 3

Direct and Indirect

Effects for all species analyzed will be the same as described for the Agency Preferred Alternative, except that alternative 3 will affect fewer acres, with activities and affects largely within the WUI areas. Although alternative 3 has fewer PTA acres for treatment, the maximum amount of acres treated annually and over the life of the project is the same. Treatments would be limited to the WUI and alongside roads (public safety areas), and therefore the extent of potential treatment impacts across the landscape would be more concentrated than and not as widespread as Alternative 2. There are fewer miles of road construction associated with implementing this alternative. With fewer constructed roads, there would be less associated direct loss of habitat and fewer direct disturbances to wildlife when compared to Alternative 2. Treatments would be focused in the WUI to protect adjacent communities and developed areas. Species may inhabit these areas, but likely at lower densities due to existing disturbances associated with roads and other types of infrastructure, and more concentrated human activity. Generally, salvage treatments would have negative effects to species analyzed as described in alternative 2. Resiliency treatments may have short-term negative effects but may benefit multiple species in the long-term. Resiliency treatments however will not be as widespread as in Alternative 2. Alternative 3 will include a lower amount of acres to be treated and fewer miles of temporary roads compared to Alternative 2. Therefore, Alternative 3 is likely to be less impactful to species analyzed in this document. Since there will be fewer acres affected across the landscape, there will be more snags and course woody debris and less incidental effects to live vegetation.

CUMULATIVE EFFECTS COMMON TO ALL ACTION ALTERNATIVES

Cumulative effects are the effects on the environment, both direct and indirect, that result from the incremental effects of an action when added to other past, present, and reasonably foreseeable future actions of the agency and other agencies or private entities (Boyle et al. 1998). There are a number of Forest Service and other entity activities in the vicinity of the proposed alternatives that have the potential to result in cumulative impacts when combined with activities proposed under the SBEADMR project. Cumulatively, implementation of this project would have minor incremental effects on Region 2 designated sensitive species, management indicator species, migratory birds and general wildlife.

Table 23 displays the present and foreseeable actions that contribute cumulatively to impacts to sensitive and management indicator species and their habitat, and whether the impacts are anticipated to be similar to those described above in the effects analysis.

Table 23. Present and Future Projects and Activities in the Cumulative Impacts Analysis Area.

Agency	District	Foreseeable Future Project	Impacts within the range of those described in direct and indirect impact (Yes/No) and effects analysis and additional comments.
USDA Forest Service	Forestwide	Ongoing Grazing Activities	No, see below
	Gunnison	Cochetopa Hills Vegetation management	Yes, Design Features included to avoid or minimize impacts to sensitive species.
	Grand Valley	Mesa Point Fuels treatments	Yes
	Norwood	Naturita Fuels	Yes. Includes invasive plant treatments in project design.
	Ouray	Owl Creek Road Maintenance	Yes.
	Grand Valley	Trickel Park Road Road improvements and maintenance	Yes.
	Forestwide, multiple locations	Trail Management	Yes, similar to impacts from roads though greatly reduced.
	Grand Valley	Resort Mesa treatments	Yes
	Ouray	Escalante Forest Restoration treatments	Yes
	Gunnison	La Garita salvage treatments	Yes, design features included to avoid or minimize impacts to sensitive species consistent with SBEADMR.

Agency	District	Foreseeable Future Project	Impacts within the range of those described in direct and indirect impact (Yes/No) and effects analysis and additional comments.
	Gunnison	Hwy 149 and Divide Salvage Sale treatments	Yes, will include design features consistent with SBEADMR
USDI BLM	Gunnison Field Office	Gunnison Spruce Beetle Response	Yes
Private landowners	N/A	Grazing	No, see below

Table 24 display types of cumulative effects with the estimated reported number of acres based on activity type from 1994-2014 across the GMUG NF. This list is not all inclusive and does not include activities on state land. Vegetation management acres as a result of fire/fuels activities include acres from wildland fires that were caused by natural ignition. Many of the activities in Table 24 overlap spatially during the time period assessed as follow-up treatments are often applied to the same "acre of land". Additionally, this report does not include private land activities which mainly overlap the non-forested valley bottoms and riparian areas. Private land activities include ranching and agricultural operations such as construction of houses and barns, roads, fences, irrigation structures and pasture utilization by livestock.

Table 24. List of Cumulative Effects Acres from 1994-2014 Based on Type

Activity	1994-2000 Acres	2001-2010 Acres	2010-2014 Acres	Total Acres 1994-2014
Vegetation Management (Silvicultural Treatments)	82,381	95,705	20,709	198,795
Vegetation Management (Fire/Fuels)	41,905	52,776	19.447	114,128
Invasive Plant Treatments	544	785	4,188	5,517
Range Improvements[1]	3,336	1,218	257	4,811
Recreation Enhancement	0	0	79	79

[1] Does not include allotment acres

The following describes the potential range of impacts anticipated from the SBEADMR action alternatives when incrementally added to the activities mentioned in the above tables. These descriptions summarize the general potential indirect impacts of changes to environmental conditions.

Vegetation Management and Fuels Reduction Projects

Vegetative treatments using silvicultural prescriptions and prescribed burning have occurred over the past few decades on National Forest System land within the SBEADMR project boundary. Table 24 displays the acreage from 1994-2014 for all reported vegetation management activities. These activities change the structure and composition of vegetation. Most planned activities tend to reduce habitat suitability in the short-term with the long-term effect of achieving desired conditions consistent with the Forest Plan and the purpose and need of the projects.

The vegetation and fuels reduction projects involve vegetation treatment similar to those proposed in the action alternatives for this project, and thus direct and indirect impacts on site are similar to those assessed in this report. Conducting many projects across the landscape in close temporal and geographic proximity increases the magnitude of positive and negative effects.

Invasive Plants

Herbicide application has occurred in various locations, mainly along roads and at other areas of soil disturbance related to past management activities. Weed control is authorized under a Forest wide EA that allows the use of herbicides. The continued introduction and spread of invasive plants will act with the proposed alternatives to decrease habitat suitability and increase competition for resources where they co-occur with terrestrial wildlife species. Continued invasive plant management would be a beneficial impact for wildlife, reducing impacts from invasive plants. Please see the Noxious and Invasive Weeds section in the Final EIS and the Invasive Plant Risk Assessment located in the project record for a full discussion of the anticipated impacts.

Grazing

Livestock grazing has been occurring since the 1800s and continues today. Most grazing allotments on the GMUG NF are used by cattle, with few domestic sheep grazing allotments. Historically, cattle, horse and sheep grazing occurred in much higher numbers than today. Currently, private land is primarily composed of cattle grazing. Grazing, both on and off Forest Service lands, has the potential to add to the effects for all species. Grazing has been identified as potentially impacting purple martin, amphibians, pygmy shrew and elk. The impacts caused by grazing include trampling, browsing, competition for forage and impacts to aquatic habitats from hoof punches. This activity would interact with the proposed action alternatives by further decreasing habitat quality.

Private Land In and Around the Project Area

Development and management of private land for agricultural uses, ranching operations, water developments, residential homes (both seasonal and year-round occupancy) and other activities occurs on private land inholdings and on lands bordering the National Forests. To protect private land owner privacy, site specific data are limited and not used in this analysis. Human population growth drives private land development and management changes over time. Several large private land ranches bordering National Forest are under conservation easements, indefinitely protecting those properties from future development and maintaining the properties for

agricultural and ranching uses only. This maintains open space, wildlife habitat and habitat connectivity, and provides a buffer of protection from development in some areas that is beneficial to National Forest watersheds.

Recreation

Recreational activities such as hunting, fishing, hiking, biking, ATV/UTV/motorcycle riding, snowmobiling, snowshoeing, back country skiing, wood cutting and camping occur on the GMUG NF. Recreation trends have changed dramatically in the past several decades, with changes in motorized recreation largely shifting from ATVs to UTVs and in general increased recreation pressure on the National Forests. There are many popular fishing and hunting areas on the GMUG NF and adjacent BLM and state land. Use of developed recreation areas such as ski resorts and designated campgrounds have increased over the last few decades. The increase in recreation use has also contributed to increased traffic numbers.

Although not due to actions from this EIS, we can expect more pressure on roads and trails, and more demand for off-road vehicle use. As a result, more invasive plant species will become introduced. Existing infestations could get larger due to spread by recreationists further impacting wildlife habitat. There is also the potential for habitat impacts and species displacement due to illegal off-road use.

Roads

Federal and state highways and county roads go through or are adjacent to the GMUG NF, providing multiple public access points. All managed roads are subject to routine maintenance activities as needed. County road maintenance is a potential cumulative effect for many wildlife species because road maintenance activities contribute to the spread of invasive plants.

Temporary roads will be constructed as part of the SBEADMR project, and some existing roads will be re-constructed or improved as a part of the project for implementation purposes (*i.e.*, improved to specifications to allow for haul trucks). Temporary roads will not be open to public use. Approximately 70% of temporary roads will be decommissioned by the timber purchaser immediately upon completion of harvest operations, and 30% will be decommissioned within five years of sale closure to allow for post-sale activities (tree planting, site prep, regeneration surveys, complete work using KV-funds, pile burning, etc.). In the short-term, temporary roads constructed under SBEADMR will increase road densities for the life of the project. In the long-term, roads will cause habitat fragmentation effects and loss of habitat until vegetation recovers. Species that use edge habitat to meet life history requirements for foraging, hunting, and cover may benefit once roads are decommissioned. The SBEADMR project will contribute to increased traffic volumes on highways, County roads and Forest Service roads due to log hauling (estimated 20 log trucks per day for timber sale projects implemented under SBEADMR) and pickup trucks used by timber sale contractors and Forest Service employees. There is the potential for increased risk of wildlife mortality due to vehicle collisions.

Climate change

Climate change is noticeable in changing patterns of precipitation, earlier springs, warmer temperatures, and less precipitation in the form of snow. Current trends indicate periods of more

severe drought and more extreme weather events. These events may cause habitat conditions to become less favorable for some species over the long term, or cause elevation shifts in species range. Climate change impacts may be exacerbated in conjunction with the effects of past, present and reasonably foreseeable anthropogenic activities, including SBEADMR. Within the next century, average temperatures are projected to increase and precipitation is projected to decrease in some of the interior areas of North America (Watson et al. 2001), which will affect vegetation conditions. Resiliency treatments and the adaptive management strategy proposed in the action alternatives may contribute to increased diversity throughout the planning area, and with careful planning and implementation could contribute to Forest resiliency and adaptability to future climate change impacts. For some wildlife species, the past, present, and reasonably foreseeable future activities addressed in this analysis may be considered minor threats in comparison to the driving primary threat of climate change. However, they could become significant when working in concert with climate change if they further suppress already stressed populations.

Generalized Effects to Terrestrial Wildlife

The proposed activities would have additive impacts to wildlife and their habitat (impacts may be beneficial and/or negative and vary spatially and temporally). SBEADMR may cumulatively increase impacts to various species on Forest Service lands when considered with other actions. Direct disturbance from treatment activities would be temporary and would be due to the presence of personnel and equipment during project implementation. Indirect effects from vegetation treatments would alter habitat conditions and in some cases, would reduce the amount of suitable habitat available for some species, while for others there may be no impact, and others would benefit. Due to the spruce bark beetle outbreak, natural processes are causing dynamic changes to the spruce-fir ecosystem and associated wildlife species, with some species benefitting and others negatively impacted at various temporal and spatial scales. Some species currently benefitting in the short-term during and immediately following the beetle outbreak (three-toed and hairy woodpeckers) may be negatively affected in the long-term, while others will likely be negatively affected long-term (hundreds of years) until multi-storied mature forests develop across the beetle-impacted landscape (canopy dependent song birds such as ruby-crowned kinglets, and species dependent on mature interior forests such as American marten, brown creeper, and red squirrel). Anecdotally, Rocky Mountain elk appear to be benefitting currently in forests with dead overstory due to an increase in herbaceous production on the forest floor and are likely to benefit long-term due to increased forage production, assuming that hiding and thermal cover requirements are met.

Vegetation management activities in the past, present and future will continue to impact species and their habitats, but the magnitude of those effects are based on the type and scale of activities. Treatments that are intended to reduce fuels will address public and firefighter safety and will have both positive and negative impacts to wildlife depending on the species and seasonal life history requirements. The effects of fuels reduction from treatments may benefit foraging habitat for some species during the summer when they are more likely to use openings and edge habitat for hunting (e.g. American marten) or foraging (e.g. elk), but could negatively impact some species during the winter when overstory cover and large course woody debris is more important (e.g. American marten). Elk may also be both positively and negatively impacted during the

summer due to increases in forage production and the cumulative reduction of hiding and thermal cover.

Noxious and invasive weed treatments, if effective, are likely to improve habitat conditions for wildlife and increase ecosystem diversity and resilience. Activities such as grazing, recreation use, road use and maintenance and the presence of private land around the project area will have a continued impact on wildlife in the area. Wildlife species have been disturbed by activities associated with recreation and with road maintenance on a regular basis, though recreation continues to increase. Grazing activities on NFS lands and on private lands would continue to affect vegetation, soil and water quality in the area and may impact amphibians and small mammal populations.

The proposed project would increase cumulative effects to all species analyzed when combined with the anthropogenic activities described above and the spruce bark beetle natural disturbance event. However, the cumulative actions are not likely to affect population viability resulting in a trend towards listing for any sensitive species due to the relatively limited extent of acres affected across the GMUG NF; within the context of the vegetation cover types affected on the GMUG NF landscape over a variety of spatial and temporal scales. When considering past, present, and reasonably foreseeable future actions documented across the GMUG NF and their impacts to associated subwatersheds evaluated in this analysis (150 subwatersheds), the total estimated percent cumulative impact to Forest Service lands in all subwatersheds combined is 5%. When considering cumulative disturbance for each individual subwatershed, the percent cumulative disturbance ranges from 0% (Wilderness Area subwatersheds) to 25%. Out of the 150 subwatersheds analyzed, 78 had a cumulative disturbance $\leq 5\%$; 141 ranged from 6 – 19% cumulative disturbance; and 9 ranged from 20 - 25% cumulative disturbance. Appendix E of this report provides a detailed analysis of cumulative impacts, comparing baseline disturbance to additive actions under SBEADMR and future disturbances.

In summary, cumulative effects that lead to reductions in habitat quality for some species, improvements in habitat quality for other species, and possible disturbance and/or displacement and loss of some individuals particularly nestlings, may impact individuals but would not likely contribute to a loss of species viability of any animal species addressed in this analysis. Implementation of project design features alleviates some of these potential impacts. The Agency Preferred Alternative (Alt. 2) has the potential to directly and indirectly impact more acres that are more wide-spread on the GMUG NF than Alternative 3, resulting in increased cumulative effects to wildlife. Overall, when considering the history of disturbances combined with present and future activities and magnitude of those effects on landscape habitat conditions, although speculative, these factors likely have meaningful impacts on wildlife demographic dynamics and seasonal habitat use patterns that are difficult to quantify.

Determination of Effect and Rationale

Based on this analysis, I determine that the No Action Alternative – Alternative 1 will have no effect; and the Agency Preferred Alternative - Alternative 2 and the WUI Alternative – Alternative 3 "***May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing*** for the northern goshawk, boreal owl, flammulated owl, olive sided flycatcher, purple martin, hoary bat, American marten and pygmy shrew. The rational for this conclusion is based on:

- The maximum acres that would be treated under all action alternatives are limited in extent to 120,000 acres. This represents only 4% of the entire land base of the GMUG National Forests. Further, treatments in spruce-fir and aspen would comprise less than 10% of these vegetation types across the GMUG.
- Design features, consistent with Forest Plan direction and policy standards will minimize effects to these species with timing restrictions and protective buffers for active nest sites, and the retention of important habitat elements including snags, downed logs and coarse woody debris and pockets of vegetation for habitat connectivity. Further rationale on how the design features will avoid or minimize impacts can be found in Appendix D of this report.

Alternatives 2 and 3 include an adaptive management scenario that takes into consideration changed conditions that result in treatment methods shifting primarily to salvage harvest of dead Engelmann spruce. The above effect determination considers current stand condition and proposed actions within SBEADMR treatment areas but also considers the effects of salvage harvest that would be applied when site conditions consist of greater than 90% mortality. As the level of spruce-beetle induced mortality changes, acres of resiliency and variable retention have the potential to shift towards salvage as described in the Silvicultural Prescription Matrices. If this occurs, the extent of potential direct and indirect effects to suitable habitat and potentially occupied habitat for Sensitive species will be greater.

Implementation of projects in the future must adhere strictly to the proposed design features and policy standards discussed in this document to avoid or minimize adverse impacts (Appendix C of this report). By following the design features and policy standards, changes in treatment type should not change the effect determination for "future" (present – 10-20 years) with adapted action. Allowing for adequate planning time to analyze and develop site specific recommendations and appropriate protection measures will be critical.

Conservation measures provided within the design criteria (Appendix C of this report) should allow the effect determination to remain unchanged for all species analyzed above. Adhering to the design features and policy standards is critical to prevent causing a trend to federal listing or a loss of species viability for Sensitive species.

MANAGEMENT INDICATOR SPECIES

Species or Species groups identification

This section analyzes impacts and describes how the action alternatives are consistent with Forest Plan direction as it relates to management indicator species. Management Indicator Species (MIS) for the GMUG National Forests are identified in the Forest Plan on Table II-15 and II-16, pages II-42 and II-43. A MIS Forest Plan Amendment in 2005 reduced the number of MIS from 17 to 12 (http://www.fs.usda.gov/detail/gmug/landmanagement/resourcemanagement/?cid=stelprdb5199918). The GMUG National Forests completed Management Indicator Species Assessments for all twelve MIS identified in the MIS Forest Plan Amendment (USDA Forest Service 2005) and can be found at: http://www.fs.usda.gov/detail/gmug/landmanagement/resourcemanagement/?cid=stelprdb5199668. These Forest-wide assessments include the rationale for the selection of MIS, information on

biology, occurrence and distribution, habitat relationships, suitable habitat on the GMUG, monitoring results, available information on population trend and source references. This SBEADMR MIS assessment tiers to the Forest-wide assessments. The following table displays the Forest list of MIS and their relationship to the SBEADMR Project Area.

Terrestrial MIS potentially affected by the no action and the two action alternatives include: Rocky Mountain Elk, Northern goshawk, American Marten and Red-naped sapsucker since they all use spruce and/or aspen habitat types during some period of their life history.

Table 25. MIS in the SBEADMR Project Area

GMUG National Forests MIS Species List			
Common Name	**Scientific Name**	**Habitat Association**	**Habitat or species Present Within the Project Analysis Area?**
Rocky Mountain elk	*Cervus elephus*	Early succession spruce-fir, Douglas-fir, lodgepole, aspen, mountain shrub. Also MIS for travel mgmt.	Y
Abert's squirrel	*Sciurus aberti*	Late-succession ponderosa pine	N
American marten	*Martes Americana*	Late-succession spruce-fir, lodgepole pine	Y
Northern goshawk	*Accipiter gentillis*	Late-succession aspen and mixed conifer	Y
Red-naped sapsucker	*Sphyrapicus nuchalis*	Pure Aspen	Y
Merriam's turkey	*Meleagris gallopavo*	Gamble oak, ponderosa pine, and Pinion-Juniper	N
Colorado river cutthroat trout	*Oncorhynchus clarki pleuriticus*	Aquatic and riparian habitats	Addressed in the Fisheries biological evaluation report
Rainbow trout	*Oncorhynchus mykiss*	Aquatic and riparian habitats	Addressed in the Fisheries biological evaluation report
Brown trout	*Oncorhynchus trutta*	Aquatic and riparian habitats	Addressed in the Fisheries biological evaluation report

GMUG National Forests MIS Species List			
Common Name	**Scientific Name**	**Habitat Association**	**Habitat or species Present Within the Project Analysis Area?**
Brook trout	*Salvelinus fontinalis*	Aquatic and riparian habitats	Addressed in the Fisheries biological evaluation report

Rocky Mountain Elk

Life History/Biology

Rocky Mountain elk are habitat generalists, but exhibiting seasonal variation in habitat use. They graze herbaceous vegetation and browse on a variety of shrub species and aspen. They are able to digest large quantities of low quality forage. Grasses, shrubs (including sagebrush), aspen twigs and bark are important winter forage components. In some areas of Colorado dead leaves also comprise a portion of their winter diet (Hobbs 1981). Generally, forbs are more important during late spring and early summer. Grasses increase in importance as the summer progresses, carrying into the fall (Fitzgerald et.al. 1994). In some areas of Colorado 77-90% of the summer diet is composed of grasses and browse constitutes 56% of the winter diet (Boyd 1970).

Under normal circumstances elk are nocturnal or crepuscular with regard to their activities. Elk tend to rest during the daytime, seeking shade and cover with good visual range. During winter elk do seek cover but also bed out on open slopes in the snow.

Many elk populations are migratory, while others are not. Elk typically exhibit altitudinal migrations, using different ranges for winter, spring (transitional), summer and fall (transitional). Summer ranges tend to be at higher elevations with winter ranges being at lower elevations. Mature bulls and cows, calves and young bulls are usually in separate herds during the spring and summer. The groups come together during the rut and in winter.

Breeding activities begin in late summer and are usually completed by the end of October. Mature bulls acquire harems consisting of cows with their calves. Females breed yearly, having up to three estrous cycles if initial breeding is unsuccessful. Yearling females are capable of breeding but only 29% of the yearling females carry calves into the fall. The success rate for mature females in Colorado is 76% (Freddy 1987). Bulls three years and older usually perform the majority of breeding. Yearling bulls that breed typically have a low conception rate. Adult cows normally produce one calf per year with twins being rare. Female bands will migrate together to calving grounds from their winter and spring ranges. The female will isolate herself from the herd to bear her calf. Calving sites are usually found where water, cover and forage are in close proximity. Two to three weeks after the calf is born, the cow and calf return to the herd.

All vegetation types present on the GMUG National Forests provide suitable elk habitat because they provide the habitat elements necessary to meet the life requirements of elk depending on the season. Colorado Parks and Wildlife data (http://cpw.state.co.us/learn/Pages/Maps.aspx/;

http://www.arcgis.com/home/search.html?q=colorado%20parks%20and%20wildlife&t=groups&focus=groups) shows that the Forest is used year-round by elk often in early successional stages of vegetation near hiding cover. Groups of elk are also observed in open areas adjacent to forested habitat on private land and on the GMUG National Forests (Vasquez 2013).

Population Status and Trend

Elk populations are monitored by Colorado Parks and Wildlife. Annual harvest and census data is used to estimate elk populations within specified geographic areas known as data analysis units (DAUs). There are 15 DAUs that overlap or occur entirely within the boundaries of the GMUG National Forests. The SBEADMR project occurs within at least a portion of all 15 DAUs.

Based on post-hunt population estimates compiled by Colorado Parks and Wildlife from 2005 to 2014, the population for all 15 DAUs has fluctuated during this time period but estimates are currently at or near population objectives and show a stable trend. Table 26 shows population estimates from 2005 – 2014 for the GMUG National Forests DAUs.

Table 26. 2005 - 2014 Post-hunt Population Estimates for DAUs on the GMUG National Forests

DAU	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
14	11,550	11,490	15,260	14,010	18,120	20,430	17,610	18,780	15,980	17,330
15	3,690	3,390	5,010	4,250	4,240	4,260	4,450	4,280	3,850	3,640
17	2,400	2,340	2,420	2,490	3,260	3,240	2,870	3,350	2,970	3,060
19	3,210	3,890	4,380	4,440	3,300	3,130	2,720	2,480	2,430	2,930
20	8,790	9,830	10,860	10,680	11,410	10,570	10,440	10,580	10,430	9,640
24	15,160	18,460	19,760	19,530	20,460	19,440	18,720	18,700	18,960	19,200
25	4,890	4,510	3,930	4,710	4,230	6,100	6,190	6,600	6,960	6,930
26	4,570	3,810	4,580	4,590	4,250	4,030	3,850	4,180	4,180	4,290
30	5,870	6,090	5,410	4,560	4,930	4,690	5,040	4,910	4,100	4,480
31	19,500	17,380	19,290	18,530	17,710	17,400	17,560	17,480	17,630	17,750
34	5,200	4,560	4,900	5,440	4,920	4,480	4,760	4,380	4,070	4,050
35	6,240	6,230	6,510	5,830	5,200	4,830	5,010	5,620	5,730	6,100
41	5,870	6,300	6,790	6,430	7,260	5,520	4,280	3,670	3,160	3,160
43	3,670	5,050	5,480	5,810	5,000	5,730	4,820	4,610	4,510	4,380
52	2,480	4,000	3,820	3,890	3,400	3,880	4,290	3,790	3,770	3,960
Total	103,090	107,330	118,400	115,190	117,690	117,730	112,610	113,410	108,730	110,900

Direct, Indirect and Cumulative Effects of Alternatives 2 and 3

Direct effects to elk include noise and audible disturbances from equipment and the presence of personnel for all treatment types, causing a temporary displacement of elk from treatment areas. Smoke associated with prescribed fire treatments may also displace elk.

All action alternatives will affect summer and fall habitat and areas used in transition during spring and fall as a result of changes in the structure and composition of vegetation. In forested areas, treatments will remove trees which will reduce the amount of thermal and hiding cover, and in some cases browse (due to aspen coppice treatments) available for elk. Forage may increase in treatment areas due to the understory being released as a result of reductions in overstory cover. Resiliency and prescribed fire treatments under Alternatives 2 and 3 may also improve habitat conditions if treatments are successful in restoring and improving resiliency of spruce fir stands against future bark beetle infestations, promoting regeneration in both aspen and spruce-fir stands, and increasing forage quality and quantity. Prescribed fire treatments will temporarily decrease the amount of forage available (perhaps for one or two growing seasons), however over time, we anticipate that forage quality and quantity will improve as grasses and shrubs sprout in response to fire activities.

Alternatives 2 and 3 are not likely to negatively affect population trends of Rocky Mountain elk. The action alternatives may affect elk distribution throughout treatment areas during project implementation. Changes in habitat that affect forage and thermal or hiding cover will also influence how elk use the landscape. Alternative 2 and 3 differ in the spatial extent of treatments and the focus of treatments (outside or inside WUI; prescribed fire and mechanical treatments, resiliency, or salvage). New temporary road construction under Alternative 2 is greater than Alternative 3; as such Alternative 2 will have greater impacts on elk distribution due to increased human disturbances along roads. Use of haul routes for winter logging activities has the potential to displace elk from winter concentration areas. Depending on winter severity, range conditions and animal health going into winter, this could result in adverse impacts to individuals in terms of increased stress that could contribute to mortality. Table 27 identifies haul routes for Alternatives 2 and 3 that go through areas currently identified by Colorado Parks and Wildlife as winter concentration areas. Appendix A (Figure A-7) of this report contains a map identifying overlap of haul routes with winter concentration areas. Design feature WFRP-15 (Appendix C of this report) will help to avoid or minimize impacts to big game on winter range.

Table 27. Length (miles) of haul routes within elk winter concentration areas (as mapped by Colorado Parks and Wildlife Species Activity Mapping data). See Appendix A, (Figure A-7) of this report, which has a map showing overlap of these routes with winter concentration areas.

Geographic Area	Haul Route ID	System Road/Jurisdiction				Grand Total
		COUNTY	NATIONAL FOREST SYSTEM ROAD	STATE HIGHWAY	US HIGHWAY	
Grand Mesa	121.0		3.54			3.54
	DELCO-SURFACE CREEK	1.78				1.78
	MESCO-64.6	2.44				2.44
	SH 65			3.45		3.45
	Total	**4.22**	**3.54**	**3.45**		**11.20**
Gunnison Basin North	7723.0		5.19			5.19
	7724.0		4.26			4.26
	7726.0	1.82	8.61			10.44
	7742.0	1.88				1.88
	SH 135			7.68		7.68
	SH 149			0.01		0.01
	US 50				11.09	11.09
	Total	**3.71**	**18.06**	**7.69**	**11.09**	**40.55**
Gunnison Basin South	SH 149			6.05		6.05
	US 50				1.43	1.43
	Total			**6.05**	**1.43**	**7.48**
North Fork Valley	265.0	0.53				0.53
	701.0	1.85				1.85
	851.0		1.84			1.84
	851.1B		1.53			1.53
	SH 133			18.05		18.05
	SH 92			1.19		1.19
	Total	**2.38**	**3.37**	**19.24**		**24.99**
San Juans	864.0		0.19			0.19
	SH 62			3.31		3.31
	SNMGCO-57P	0.09				0.09
	US 50				5.32	5.32
	US 550				11.02	11.02
	Total	**0.09**	**0.19**	**3.31**	**16.34**	**19.93**
Uncompahgre Plateau	503.0	5.58	0.00			5.58
	536.0		1.28			1.28
	540.0	0.37				0.37
	SH 141			13.78		13.78
	US 550				4.09	4.09

Total	**5.95**	**1.28**	**13.78**	**4.09**	**25.10**
Grand Total	**16.35**	**26.44**	**53.53**	**32.94**	**129.26**

The action alternatives are expected to treat the same amount of acres both annually and over the life of the project, with Alternative 3 concentrated in the WUI and Alternative 2 more widespread on the Forest. With Alternative 2 affecting a larger spatial extent, we anticipate Alternative 2 to directly and indirectly affect more habitat than Alternative 3 (Table 28 and Table 29).

Table 28 - Activities proposed under alternative 2 - overlap with elk foraging and cover habitat (acres) within each Geographic Area.

Geographic Area	Elk Habitat?	Hazard Trees Total	New Roads Total	Priority Treatment Area (PTA)					PTA Total	Grand Total
				Noncommercial		Commercial				
				Burn and Mechanical	Mechanical	Combination	Resiliency	Salvage		
Grand Mesa	Not Elk Habitat	0.80	3.43	1,023.94	10.28	1.15	3.74	0.08	1,039.19	1,043.42
	Elk Habitat	1,074.42	15.39	20,896.48	1,434.31	8,807.03	6,159.58	485.46	37,782.85	38,872.66
	Total	**1,075.22**	**18.82**	**21,920.42**	**1,444.59**	**8,808.17**	**6,163.32**	**485.54**	**38,822.04**	**39,916.08**
Gunnison Basin North	Not Elk Habitat	0.62	12.18	1,634.22			4.44		1,638.66	1,651.46
	Elk Habitat	3,695.17	36.93	46,751.36		6,897.30	6,658.59	1,824.98	62,132.22	65,864.32
	Total	**3,695.79**	**49.11**	**48,385.57**		**6,897.30**	**6,663.03**	**1,824.98**	**63,770.88**	**67,515.79**
Gunnison Basin South	Not Elk Habitat	17.84	2.97	714.16		1.61	5.00	1.46	722.23	743.05
	Elk Habitat	4,775.93	41.04	17,785.72		11,332.88	4,413.93	12,059.93	45,592.47	50,409.44
	Total	**4,793.78**	**44.01**	**18,499.88**		**11,334.49**	**4,418.93**	**12,061.39**	**46,314.70**	**51,152.49**
North Fork Valley	Not Elk Habitat	6.00	1.66	525.44	4.32		12.65		542.40	550.07
	Elk Habitat	2,251.59	23.38	11,699.07	915.66	3,356.33	5,011.87	544.35	21,527.28	23,802.26
	Total	**2,257.60**	**25.05**	**12,224.51**	**919.97**	**3,356.33**	**5,024.52**	**544.35**	**22,069.69**	**24,352.33**
San Juans	Not Elk Habitat	2.21	9.30	50.93		1.27	9.60	0.01	61.81	73.31
	Elk Habitat	2,020.67	32.77	378.89		7,771.26	2,585.33	1,830.25	12,565.72	14,619.15
	Total	**2,022.87**	**42.07**	**429.81**		**7,772.53**	**2,594.93**	**1,830.25**	**12,627.52**	**14,692.47**
Uncompahgre Plateau	Not Elk Habitat	14.14	0.92	2,261.22		8.46	85.68	5.23	2,360.59	2,375.65
	Elk Habitat	3,527.57	33.45	38,969.28		14,988.39	17,548.62	351.72	71,858.01	75,419.03
	Total	**3,541.71**	**34.37**	**41,230.51**		**14,996.85**	**17,634.30**	**356.94**	**74,218.60**	**77,794.68**
Grand Total		**17,386.98**	**213.43**	**142,690.71**	**2,364.57**	**53,165.67**	**42,499.03**	**17,103.46**	**257,823.43**	**275,423.84**

Table 29 - Activities proposed under alternative 3 - overlap with elk foraging and cover habitat (acres) within each Geographic Area.

Geographic Area	Elk Habitat?	Hazard Trees Total	New Roads Total	Priority Treatment Area (PTA)					PTA Total	Grand Total
				Noncommercial		Commercial				
				Burn and Mechanical	Mechanical	Combination	Resiliency	Salvage		
Grand Mesa	Not Elk Habitat	0.90	2.86	747.28	10.28	0.52	1.17		759.24	763.01
	Elk Habitat	1,515.45	25.28	16,562.67	1,434.31	5,282.66	3,603.46	376.13	27,259.22	28,799.96
	Total	**1,516.36**	**28.14**	**17,309.94**	**1,444.59**	**5,283.17**	**3,604.63**	**376.13**	**28,018.47**	**29,562.97**
Gunnison Basin North	Not Elk Habitat	0.62	0.25	966.22			1.36		967.58	968.45
	Elk Habitat	5,240.15	31.39	34,614.78		1,729.93	1,867.04	729.50	38,941.27	44,212.80
	Total	**5,240.77**	**31.64**	**35,581.00**		**1,729.93**	**1,868.41**	**729.50**	**39,908.85**	**45,181.26**
Gunnison Basin South	Not Elk Habitat	19.91	0.76	502.36		0.64	0.04	0.12	503.15	523.82
	Elk Habitat	7,392.76	18.71	6,788.50		1,636.75	999.27	1,258.92	10,683.45	18,094.92
	Total	**7,412.67**	**19.47**	**7,290.86**		**1,637.38**	**999.31**	**1,259.05**	**11,186.60**	**18,618.74**
North Fork Valley	Not Elk Habitat	21.34	1.66	300.49	4.26		12.65		317.39	340.39
	Elk Habitat	2,795.07	18.65	9,176.35	893.08	1,761.47	4,280.64	55.96	16,167.51	18,981.23
	Total	**2,816.42**	**20.31**	**9,476.84**	**897.34**	**1,761.47**	**4,293.28**	**55.96**	**16,484.89**	**19,321.62**
San Juans	Not Elk Habitat	2.88		50.93		1.24	6.53	0.00	58.70	61.58
	Elk Habitat	2,513.04	22.16	378.89		3,135.64	1,069.20	651.80	5,235.53	7,770.73
	Total	**2,515.92**	**22.16**	**429.81**		**3,136.89**	**1,075.72**	**651.80**	**5,294.23**	**7,832.31**
Uncompahgre Plateau	Not Elk Habitat	26.58	0.90	1,921.76		0.35	4.99		1,927.11	1,954.58
	Elk Habitat	5,165.19	32.44	31,480.81		8,765.48	7,880.51	217.88	48,344.69	53,542.31
	Total	**5,191.77**	**33.34**	**33,402.58**		**8,765.83**	**7,885.51**	**217.88**	**50,271.79**	**55,496.90**
	Grand Total	**24,693.90**	**155.06**	**103,491.03**	**2,341.93**	**22,314.68**	**19,726.86**	**3,290.33**	**151,164.83**	**176,013.80**

Colorado Parks and Wildlife Species Activity Mapping is available that identifies elk production (calving) areas. There is overlap of production areas with proposed treatment areas. However, elk are not limited to calving in the mapped production areas and calving could occur nearly anywhere in suitable elk habitat ranging from low elevation sagebrush or meadow areas with adequate cover to high elevation alpine. Design feature WFRP-6 (Appendix C of this report) will avoid impacts to elk in known calving areas. Colorado Parks and Wildlife mapped production areas will be used to help prioritize and identify key areas that may provide high quality calving areas where this design feature may need to be applied. Appendix A (Figure A-8) of this report contains a map identifying overlap of mapped production areas with treatment areas.

Direct and indirect effects would most likely result in temporary displacement or cause shifts in elk behavioral patterns and habitat use. This displacement is expected to be short term with elk use returning to the same level or possibly greater level in treatment areas due to an increase in forage quality and quantity. There will be minor increases in temporary road density; fewer disturbances would occur in Alternative 3 due to fewer miles of roads utilized compared to Alternative 2. Commercial treatments, particularly hazard tree removal along roads, will reduce cover for elk. Design feature WFRP-5(Appendix C of this report) is intended to ensure that adequate cover is maintained.

SBEADMR Habitat Effectiveness Results

Summary

In accordance with Forest Plan requirements, a baseline habitat effectiveness (HE) as influenced by road densities was analyzed in all 6th order watersheds in which commercial activities are planned. HE was also calculated for the difference in road densities resulting from Alternative 2 and Alternative 3.

All of the habitat effectiveness calculations for the 6th order watersheds were found to be in compliance with the forest standard of 40 percent. HE was then analyzed per management area within their respective watershed; several areas were identified which did not meet the HE standards described in the Forest Plan. HE is designed to measure habitat quality for big game species.

Habitat Effectiveness By Management Area

Management areas which had a HE standard, per the Forest Plan (1991) were first identified. These included: 3A Semi-primitive non-motorized recreation experience, 4B optimize habitat capability for all management indicator species, 4D aspen management, 5A optimize habitat capability for big game on non-forested winter-range, and 5B optimize habitat capability for big game on forested winter-range. Only management areas which fell within the affected commercial 6th order watersheds and those which had new road proposals were analyzed. Management areas 3A, 5A, and 5B were excluded from analysis as these either did not fall within the affected watersheds and/or there were no new road proposals (Alt 2 and Alt3) that would affect them. Forest Plan Standards for the 4B and 4D management areas include the following:

- 4B - Work towards a maximum level of 80 percent habitat effectiveness for elk.
- 4D - Work toward a minimum level of 60 percent habitat effectiveness for elk.

Habitat effectiveness values were then calculated and evaluated for the 4B and 4D management areas by watershed for the baseline, Alternative 2, and Alternative 3. All watersheds analyzed currently meet Forest Plan Standards and continued to meet the standards in the action alternatives, with the exception of those noted in the following tables. Eight watersheds do not meet the Forest Plan Standards for Management Area 4D or 4B (Table 30). Upper Roubideau Creek does not currently meet HE for either 4D or 4B. Table 31 and Table 32 compare the baseline to Alternatives 2 and 3. Considering the maximum proposed roads for Alternative 2, HE for each of these watersheds is slightly decreased. One additional watershed, Upper Spring Creek, would drop below the 60% threshold established in the Forest Plan for MA 4D, and

another – Headwaters Naturita Creek – would drop below the 80% threshold established for MA 4B. Considering the maximum proposed roads for Alternative 3, the effects are similar but impact HE to a lesser degree. Figure A-9 and A-10 (Appendix A of this report) compare the baseline with Alternatives 2 and 3, identifying the watersheds where Forest Plan Standards for habitat effectiveness are not met.

However, under both action alternatives, all of the newly constructed roads would be temporary, likely existing for less than seven years prior to being decommissioned. Furthermore, as HE is a measure of open road density, and none of these roads would be open to the public, this is an overestimate of the potential impact.

Table 30. Watersheds That Contain a Management Area in Which Forest Plan Standards Were Not Met, Baseline Data.

Watershed ID	Watershed Name	Management Area	Acres Affected	Weighted Road Density*	Habitat Effectiveness
140200050305	Dry Fork Escalante Creek	4D >60% HE	104.53	3.0642	38
140200050204	Cottonwood Creek	4D >60% HE	137.338	3.1285	38
140200050201	Upper Roubideau Creek	4D >60% HE	4,327.99	1.1224	57
140300030302	Headwaters Beaver Creek	4B >80% HE	1137.862	0.8394	64
140300030202	Middle Horsefly Creek	4B >80% HE	452.138	1.8402	50
140200060501	Headwaters Dry Creek	4B >80% HE	2598.522	1.1578	57
140200050201	Upper Roubideau Creek	4B >80% HE	3420.993	1.4649	54
140200040406	Terror Creek	4B >80% HE	5413.661	0.7182	68

Table 31. Watersheds that Contain a Management Area in Which Forest Plan Standards Were Not Met, Baseline Data in combination with Alternative 2 (Appendix A; Figure A-9 and Figure A-10).

Watershed ID	Watershed Name	Management Area	Acres Affected	Weighted Road Density*	Habitat Effectiveness %
140200050305	Dry Fork Escalante Creek	4D >60% HE	104.53	3.2112	37
140200050204	Cottonwood Creek	4D >60% HE	137.338	3.2326	37
140200050201	Upper Roubideau Creek	4D >60% HE	4,327.99	1.163	57
140200060601	Upper Spring Creek[1]	4D >60% HE	2520.609	1.0652	59
140300030401	Headwaters Naturita Creek[1]	4B >80% HE	893	0.4297	78
140300030302	Headwaters Beaver Creek	4B >80% HE	1137.862	0.9006	63
140300030202	Middle Horsefly Creek	4B >80% HE	452.138	1.8581	50
140200060501	Headwaters Dry Creek	4B >80% HE	2598.522	1.1925	57
140200050201	Upper Roubideau Creek	4B >80% HE	3420.993	1.4753	54
140200040406	Terror Creek	4B >80% HE	5413.661	0.7269	68

[1]The 4D and 4B Management Areas within these two watersheds met Forest Plan Standards under the existing condition, but Alternative 2 would reduce habitat effectiveness values slightly below Standards by 1.6% in the 4D Management Area, and by 2.5% in the 4B Management Area.

The remaining watersheds in this table contain Management Areas that already did not meet Forest Plan Standards in the existing baseline.

Table 32. Watersheds That Contain a Management Area in Which Forest Plan Standards Were Not Met When Considering Baseline Data Plus Alternative 3 (Appendix A; Figure A-9 and Figure A-10).

Watershed ID	Watershed Name	Management Area	Acres Affected	Weighted Road Density*	Habitat Effectiveness
140200050305	Dry Fork Escalante Creek	4D >60% HE	104.53	3.0642	38
140200050204	Cottonwood Creek	4D >60% HE	137.338	3.1285	38
140200050201	Upper Roubideau Creek	4D >60% HE	4,327.99	1.1224	57
140200060601	**Upper Spring Creek[1]**	4D >60% HE	2520.609	1.0652	59
140300030401	Headwaters Naturita Creek	4B >80% HE	893	0.3877	80
140300030302	Headwaters Beaver Creek	4B >80% HE	1137.862	0.8394	64
140300030202	Middle Horsefly Creek	4B >80% HE	452.138	1.8402	50
140200060501	Headwaters Dry Creek	4B >80% HE	2598.522	1.1898	57
140200050201	Upper Roubideau Creek	4B >80% HE	3420.993	1.4649	54
140200040406	Terror Creek	4B >80% HE	5413.661	0.7242	68

[1]The 4D Management Area in the Upper Spring Creek watershed met Forest Plan Standards under the existing condition, but Alternative 3 would reduce habitat effectiveness values slightly below Standards by 1.6%.

This watershed failed Forest Plan Standards for Alternative 2, but would meet habitat capability requirements for Alternative 3.

The remaining watersheds in this table contain Management Areas that already did not meet Forest Plan Standards in the existing baseline.

*

Road Density = road mileage / (acreage of analysis area/640) = miles of roads/square mile

Weighted Road Density = road density X WRD co-efficient

Habitat Effectiveness is related to weighted road density WRD (WRD is called average adjusted miles of open roads/trails in the Forest Plan) (see pg III-77 Forest Plan 1991)

Coefficients are outlined in the Forest Plan (III-77) and are based on the Road Type

Road Types	Coefficient
Primary	1.0
Secondary	0.7
Primitive	0.05
None (CLOSED)	0.7

Temporary Roads proposed for Alternative 2 and Alternative 3 were considered as primitive
Roads fall into their respective type based on the Maintenance Level for roads and the Allowed Terra Use for trails

Road Type	Maintenance Level
Primary	3-5
Secondary	1-2 (Includes Jeep Trails and non-system roads)
Primitive	Motorized Trails (ATV and Motorcycle)
None (CLOSED)	Non-System**

**I considered non-system roads as secondary roads due to the fact that it is likely full-sized vehicles that are using them

Cumulative Effects

In terms of affected acres, cumulative effects are expected to be similar for both action alternatives since the maximum total acres that could be treated is the same (maximum 120,000 acres), although they differ in their spatial distribution on the landscape. There is approximately 2,812,400 acres of habitat supporting elk on the GMUG through their various seasonal life history periods. Of this amount, potentially affected areas include 268,987 acres (9.5%) under Alternative 2 and 171,402 acres (6.1%) under alternative 3. Maximum treatment areas under both action alternatives are 60,000 acres commercial mechanical and 60,000 acres non-commercial mechanical and prescribed fire. This is approximately 4% of the total elk habitat on the GMUG. Treatments in aspen are designed to increase stand resiliency which has been found successful in stands with less than 50% overstory mortality (Shepperd et al 2015). Therefore, resiliency treatments may have short-term negative effects from removal of mature aspen and disturbance during implementation, but we anticipate long-term beneficial effects if treatments are successful in stimulating aspen regeneration on the landscape. Resiliency treatments in spruce will increase tree age-class diversity potentially increasing foraging habitat, hiding cover, and thermal cover as stand density and tree height increases. Salvage treatments may increase forbs and grasses in some areas. Design features would avoid or lessen impacts to elk and all MIS and in some cases, helps achieve habitat management objectives for those species. Increased age-class diversity in spruce and aspen would contribute to reduced vulnerability of the stands to insect and disease, as well as other stressors.

Due to the relatively limited extent of acres potentially treated across the GMUG National Forests, no discernible changes in population trends are anticipated at the DAU or Forest level.

Effects of Alternative 1

There will be no human-induced effects as a result of the No Action alternative. No treatments will occur and vegetation in the area would continue to be affected naturally by ecosystem patterns and processes. Decreases in canopy cover due to dead trees may result in more forage being available and could influence elk distribution. If there are large areas that experience windthrow events resulting in large volumes of coarse woody debris accumulating, elk movement patterns and distribution could also be affected. There would be no human-influenced or additive impacts since harvest and vegetation manipulation would not occur. No discernible change in population trends at the DAU or Forest levels are expected.

Rocky Mountain Elk rely on both spruce-fir and aspen habitat types on the GMUG. Spruce-fir is primarily used in the summer for foraging and cover and aspen is used during all seasons. The total amount of area of aspen stands affected by sudden aspen decline on the GMUG is currently at 229,000 acres with no further increase expected. The total amount of spruce-fir forest affected by spruce beetle is currently estimated at 223,000 acres, with additional increases in affected acres anticipated. The loss of mature spruce and aspen will reduce cover for elk but increases in under-story vegetation will result in increased summer foraging habitat. In stands affected by sudden aspen decline where regeneration is lacking or poor, the amount of young aspen may decline without active management (Shepperd et al. 2015). However, we anticipate increases in aspen within Engelmann spruce-aspen mixed stands as overstory Engelmann spruce trees succumb to spruce beetle.

American Marten

Life History/Biology

A description of the life history and biology of American marten is included above in the Sensitive Species section.

Population Status and Trend

As of 2005, twenty-eight marten territories were estimated to occur on the Forest. Less than 1% of suitable marten habitat was surveyed therefore the actual number of marten territories on the Forest is unknown. All suitable habitats surveyed resulted in marten detections. In Colorado, trapping, was banned by a referendum in 1996 (Andelt et al. 1999, Buskirk 2002); there was a closed season for marten from 1996 until 2006. Beginning in 2006, trapping was again opened for marten. During the 10-year period of closed seasons there may have been an increase in marten populations. However, with the lack of harvest and monitoring data for the species in Colorado, there is no data to support this speculation. Due to the potential for rapid landscape scale habitat alteration in subalpine forests from disease and insect infestations, Colorado Parks and Wildlife has improved monitoring of pine marten harvests in recent years (Apker 2013). Year-to-year fluctuations in population size of marten are common, and typically correlate with fluctuations in densities of small mammals (Weckwerth and Hawley 1962, Buskirk and Ruggeiro 1994, Fryxell et al. 1999). However, descriptions of long-term changes in densities are virtually absent from the literature (Buskirk 2002). Since only a small percentage of the available marten habitat has been inventoried and due to inconsistent survey effort from year to year across Ranger Districts, population trends on the Forest cannot be determined at this time.

Effects of Alternatives 2 and 3

This species is addressed in this document as a Forest Service Sensitive species in the Sensitive Species section above. Please refer to the Sensitive species section for a more detailed analysis.

Effects to American marten populations as a result of Alternatives 2 and 3 include displacement due to direct disturbance from treatment activities and associated habitat effects as described above in the Sensitive Species section.

Both alternatives will affect marten habitat due to changes in the structure and composition of forested areas. Treatments will alter stand structure and remove large areas of dead trees which will reduce habitat quality and cause avoidance of created openings. Some habitat elements will be retained, but at decreased levels compared to the existing condition. Abundant course woody debris is an important habitat requirement of martens. Project design features require maintaining snags and large diameter downed logs of various decay composition within harvest units. Design features will help maintain suitable habitat on the landscape and habitat connectivity in terms of maintaining connections between large blocks of undisturbed habitat. Denning and winter habitat would be degraded because project activities would result in stands that are more open leaving less cover for martens important for their prey, denning habitat, and subnivean access beneath snow during winter for hunting. Resiliency treatments are intended to improve the health of forested stands by promoting multi-age classes and regeneration which, if successful in achieving these desired conditions could benefit martens in the long-term.

Effects of Alternatives 1

There will be no human-induced effects as a result of the No Action alternative. No treatments will occur and vegetation in the area would continue to naturally develop as influenced by ecosystem patterns and processes. In the short-term, martens may benefit from the spruce beetle outbreak as increases in large course woody debris accumulate. Over time, decreases in overstory canopy cover and reductions in red squirrels due to the loss of mature cone-producing spruce trees will reduce habitat quality and prey for marten. There would be no human-influenced or additive impacts since harvest and vegetation manipulation would not occur. Due to the rapid spruce beetle outbreak and landscape-scale disturbance, there is the possibility of discernible change in population trends at the Forest level.

Northern Goshawk

Life History/Biology

A description of the life history and biology of northern goshawks is included above in the Sensitive Species section of this document.

Population Status and Trend

Currently, there are no long-term indices of trends or estimates of goshawk breeding population size in North America (Braun et al. 1996, There is not sufficient information available to determine the population status across Colorado or within Region 2. Breeding Bird Survey (BBS) and Christmas Bird Count (CBC) data is not sufficient because there are not enough routes to cover goshawk habitat and detections of birds is low.

Surveys for goshawks have occurred across the GMUG NF for over 20 years. Based on survey information, there is an estimated 37 known territories based on detections and associated nest sites and 34 territories based on detections during the breeding season with no associated known

nest site. Overall, the species appears well distributed across the Forest and has not shown any obvious change in population based on annual monitoring of known nest sites.

Effects of Alternatives 2 and 3

This species is also addressed in this document as a Forest Service Sensitive species. Please refer to the Sensitive species section above for a more detailed analysis.

Effects to northern goshawk populations as a result of Alternatives 2 and 3 include noise disturbance due to treatment activities, and the presence of personnel and smoke associated with prescribed fire treatments. Activities may cause goshawks to temporarily displace from the project area. A design feature included in the proposed action requires surveys to be completed for raptors in the project area each year. If an active nest site is found within a treatment unit, avoidance measures will be taken.

All action alternatives will result in changes in habitat structure and habitat quality. Treatments are not expected to affect goshawk nest sites. Treatments will reduce canopy cover but goshawks use a large diversity of forest structure, edge habitat, and openings for hunting. Prescribed fire treatments may improve foraging habitat for goshawks because they would open up the understory, but are not likely to reduce canopy cover. The proposed action also includes design features which will minimize effects to important habitat elements for some goshawk prey species such as snags and coarse woody debris. Alternatives 2 and 3 may improve habitat conditions in the long term by restoring and improving resiliency of spruce fir stands against future bark beetle infestations, and promoting regeneration in both aspen and spruce-fir stands.

Aspen treatments would cause reductions in high quality habitat by removing mature trees, but would also stimulate aspen regeneration that would be anticipated to benefit goshawk habitat in the long-term. The action alternatives may temporarily displace individuals through habitat alteration and/or disturbance, but these effects will not result in a change in population numbers or trends at the Forest scale.

Effects of Alternative 1

There will be no human-induced effects as a result of the No Action alternative. No treatments will occur and vegetation in the area would continue to naturally develop. Mature aspen and aspen/mixed conifer stands within the analysis area would continue to persist. Mature, aspen-dominated closed canopy forests would continue to provide suitable nesting habitat. The spruce beetle outbreak may be beneficial to goshawks in terms of increasing foraging opportunities (e.g., increased woodpecker prey species due to the beetles). Reductions in overstory canopy from dead trees may reduce habitat quality in some areas. There would be no human-influenced or additive impacts since harvest and vegetation manipulation would not occur. No discernible change in population trends are anticipated at the Forest level.

Red-Naped Sapsucker

Life History/Biology

The Forest is well within the breeding distribution range of the red-naped sapsucker. Throughout western and central Colorado, they breed regularly within deciduous woodlands, especially where deciduous woodlands are associated with riparian areas that contain a willow component. On the Forest, red-naped sapsuckers are primarily associated with mature aspen forests, mature aspen and conifer mixes, and aspen riparian areas with a willow component.

Primary (high quality) red-naped sapsucker nesting habitat was identified as mature aspen and cottonwood, especially aspen and cottonwood habitat types associated with riparian areas containing a willow component. Red-naped sapsuckers typically nest in close proximity to willow vegetation; consequently willow was included as one of the habitat components of nesting habitat. Primary foraging habitat includes sapling/pole, mid-age, and mature aspen and cottonwood, in addition to willow riparian associations. The location of high quality foraging habitat, such as willow riparian areas, may dictate the location of red-naped sapsucker nest trees.

Red-naped sapsucker feeds primarily in sap wells that they create in the xylem of trunks or stems of conifer trees, including Rocky Mountain juniper, Douglas-fir, lodgepole pine, and ponderosa pine. Xylem sap wells are characterized by a series of parallel circular holes that usually completely surround a stem or trunk (Walters et al. 2002). Once deciduous trees and shrubs leaf out, the red-naped sapsucker preferentially forages among aspen and cottonwood stands associated with willow riparian areas.

Although red-naped sapsuckers are specialized for sipping sap, their diet also includes insects, inner bark, fruit, and seeds (Walters et al. 2002). This species feeds on aspen buds and has been observed fly-catching exclusively in aspen and gleaning insects from aspen, Douglas-fir, and cottonwood (Walters 1996). During the breeding season, the red-naped sapsucker spends the majority of its time maintaining sap wells and searching for insects to feed nestlings (Walters et al. 2002). Adults often crush prey and sometimes mix insects with sap prior to feeding young (Wible 1960). Juvenile sapsuckers are capable of foraging on their own soon after they leave the nest (Crockett and Hansley 1977, Tobalske 1992).

Population Status and Trend

Since 1998, the Bird Conservancy of the Rockies (formerly Rocky Mountain Bird Observatory) obtains density estimates for bird species in Colorado. Their data provides population trend estimates when counts have been obtained over a sufficient number of years. Data for relative abundances of red-naped sapsucker and population trends in Colorado is available online at: http://rmbo.org/v3/InfoCenter/Databases.aspx.

Effects of Alternatives 2 and 3

Effects to red-naped sapsucker as a result of Alternatives 2 and 3 include noise disturbance due to treatment activities and the presence of personnel and equipment as well as smoke associated with prescribed fire treatments. Treatment activities may cause temporary displacement of individuals. Prolonged disturbances at or near nest sites could cause nest abandonment or prevent adults from delivering food to chicks, thus there is a slight chance of mortality of individuals.

All alternatives will affect sapsucker habitat due to changes in the structure and composition of aspen stands. Of the approximately 900,000 acres of habitat (primarily aspen cover type) supporting sapsuckers across the GMUG, treatment acres within aspen is negligible compared to the amount of available habitat Forest-wide. All treatments are intended to promote regeneration and improve resiliency of stands to sudden aspen decline. This should help maintain aspen on the landscape and promote the future development of habitat for the red-naped sapsucker. Commercial mechanical, non-commercial mechanical and prescribed fire treatments could impact aspen forests but due to a limited commercial market for aspen most treatments are expected to be non-commercial primarily using prescribed fire. Treatments in aspen are designed to increase stand resiliency which has proven to be very success in stands with less than 50%

overstory mortality (Shepperd et al 2015). Therefore resiliency treatments may have short-term negative effects since mature aspen will be reduced but a long-term beneficial effect as aspen is regenerated on the landscape. Table 33, Table 34, and Table 35 quantifies suitable red-naped sapsucker habitat on the GMUG NF that may be affected by the action alternatives. Appendix A (Figure A-1 and A- 2) of this report contains maps showing potentially affected habitat that overlaps Alternatives 2 and 3.

Table 33. Activities proposed under alternative 2 – overlap with red-naped sapsucker habitat (acres) within each Geographic Area (Appendix A; Figure A-1 of this report).

Geographic Area	Red-naped Sapsucker Habitat?	Hazard Trees	New Roads Outside PTA	Priority Treatment Areas					PTA Total	Grand Total[1]
				Noncommercial		Commercial				
				Burn and Mechanical	Mechanical	Combination	Resiliency	Salvage		
Grand Mesa	Not Red-Naped Sapsucker Habitat	636	17	8,086	595	8,783	5,611	486	23,561	24,215
	Red-naped Sapsucker Habitat	439	1	13,834	850	25	552		15,261	15,702
	Total	**1,075**	**19**	**21,920**	**1,445**	**8,808**	**6,163**	**486**	**38,822**	**39,916**
Gunnison Basin North	Not Red-Naped Sapsucker Habitat	2,012	46	21,332		6,895	5,175	1,825	35,227	37,285
	Red-naped Sapsucker Habitat	1,683	3	27,054		2	1,488		28,544	30,231
	Total	**3,696**	**49**	**48,386**		**6,897**	**6,663**	**1,825**	**63,771**	**67,516**
Gunnison Basin South	Not Red-Naped Sapsucker Habitat	2,132	39	10,724		10,097	3,090	11,772	35,683	37,854
	Red-naped Sapsucker Habitat	2,661	5	7,776		1,238	1,329	289	10,632	13,298
	Total	**4,794**	**44**	**18,500**		**11,334**	**4,419**	**12,061**	**46,315**	**51,152**
North Fork Valley	Not Red-Naped Sapsucker Habitat	732	18	5,552	54	3,277	2,413	544	11,841	12,591
	Red-naped Sapsucker Habitat	1,526	7	6,673	866	79	2,611		10,229	11,762
	Total	**2,258**	**25**	**12,225**	**920**	**3,356**	**5,025**	**544**	**22,070**	**24,352**
San Juans	Not Red-Naped Sapsucker Habitat	1,271	36	333		7,553	955	1,794	10,636	11,944
	Red-naped Sapsucker Habitat	752	6	96		219	1,640	36	1,991	2,749
	Total	**2,023**	**42**	**430**		**7,773**	**2,595**	**1,830**	**12,628**	**14,692**
Uncompahgre Plateau	Not Red-Naped Sapsucker Habitat	353	15	15,167		12,653	5,500	282	33,602	33,970
	Red-naped Sapsucker Habitat	3,189	19	26,063		2,344	12,135	75	40,616	43,824
	Total	**3,542**	**34**	**41,231**		**14,997**	**17,634**	**357**	**74,219**	**77,795**
Grand Total		**17,387**	**213**	**142,691**	**2,365**	**53,166**	**42,499**	**17,103**	**257,823**	**275,424**

[1]There are a total of 275,424 acres where proposed activities under Alternative 2 could occur. Of those acres, 117,566 acres (42.7%) are in red-naped sapsucker cover/foraging habitat. Prior to implementation, field surveys would verify where suitable habitat occurs in project areas and appropriate design features would be applied to manage habitat based on best available science (USFS 2014). This analysis represents the maximum area where activities could potentially occur spatially and temporally during the life of the project (8 - 12 years). During the life of the project, these proposed activities have the potential to affect up to 12.4% of the total cover/forage habitat on the GMUG National Forests.

Table 34. Activities proposed under alternative 3 – overlap with red-naped sapsucker habitat (acres) within each Geographic Area (Appendix A; Figure A-2 of this report).

Geographic Areas	Red-naped Sapsucker Habitat?	Hazard Trees	New Roads	Priority Treatment Areas					PTA Total	Grand Total[1]
				Noncommercial		Commercial				
				Burn and Mechanical	Mechanical	Combination	Resiliency	Salvage		
Grand Mesa	Not Red-naped Sapsucker Habitat	1,023	27	6,142	595	5,269	3,102	376	15,483	16,533 (56%)
	Red-naped Sapsucker Habitat	493	1	11,168	850	14	503		12,535	13,030 (44%)
	Total	**1,516**	**28**	**17,310**	**1,445**	**5,283**	**3,605**	**376**	**28,018**	**29,563**
Gunnison Basin North	Not Red-naped Sapsucker Habitat	2,929	43	16,154		1,985	1,309	732	20,181	23,153 (50.5%)
	Red-naped Sapsucker Habitat	2,312	1	19,427		1	935		20,363	22,676 (49.5%)
	Total	**5,241**	**45**	**35,581**		**1,986**	**2,245**	**732**	**40,544**	**45,829**
Gunnison Basin South	Not Red-naped Sapsucker Habitat	4,229	19	4,093		1,404	692	1,198	7,388	11,636 (62.5%)
	Red-naped Sapsucker Habitat	3,183	1	3,197		233	307	61	3,799	6,983 (37.5%)
	Total	**7,413**	**20**	**7,291**		**1,637**	**999**	**1,259**	**11,187**	**18,619**
North Fork Valley	Not Red-naped Sapsucker Habitat	1,047	13	4,604	54	1,683	1,755	56	8,151	9,210 (47.7%)
	Red-naped Sapsucker Habitat	1,770	7	4,873	844	79	2,539		8,334	10,111 (52.3%)
	Total	**2,816**	**20**	**9,477**	**897**	**1,761**	**4,293**	**56**	**16,485**	**19,322**
San Juans	Not Red-naped Sapsucker Habitat	1,669	20	333		3,019	428	652	4,433	6,122 (78%)
	Red-naped Sapsucker Habitat	847	3	96		117	647		861	1,711 (22%)
	Total	**2,516**	**22**	**430**		**3,137**	**1,076**	**652**	**5,294**	**7,833**
Uncompahgre Plateau	Not Red-naped Sapsucker Habitat	1,101	20	12,405		7,555	2,193	176	22,329	23,450 (42%)
	Red-naped Sapsucker Habitat	4,091	14	20,997		1,211	5,693	42	27,943	32,047 (58%)
	Total	**5,192**	**34**	**33,403**		**8,766**	**7,886**	**218**	**50,272**	**55,497**
Grand Total		**24,694**	**169**	**103,491**	**2,342**	**22,571**	**20,103**	**3,293**	**151,800**	**176,662**

[1]There are a total of 176,662 acres where proposed activities under Alternative 3 could occur. Of those acres, 86,558 acres (49%) are in red-naped sapsucker cover/foraging habitat. Prior to implementation, field surveys would verify where suitable habitat occurs in project areas and appropriate design features would be applied to manage habitat based on best available science (USFS 2014). This analysis represents the maximum area where activities could potentially occur spatially and temporally during the life of the project (8 - 12 years). During the life of the project, these proposed activities have the potential to affect up to 9% of the total cover/forage habitat on the GMUG National Forests.

Table 35. Comparison of Alternatives 2 and 3 to the Baseline – Potentially affected red-naped sapsucker habitat (acres) within each Geographic Area.

Geographic Area	Alt. 2 Potentially Affected Areas[1]	Alt. 3 Potentially Affected Areas	Red-naped Sapsucker Summer Cover and Foraging Habitat (Baseline)[2]	Red-naped Sapsucker Habitat Potentially Affected by Alt. 2 (% of Total Habitat)	Red-naped Sapsucker Habitat Potentially Affected by Alt. 3 (% of Total Habitat)
Grand Mesa	39,916	29,563	96,831	15,702	13,030
Gunnison Basin North	67,516	45,829	209,269	30,231	22,676
Gunnison Basin South	51,152	18,619	139,296	13,298	6,983
North Fork Valley	24,352	19,322	221,451	11,762	10,111
San Juans	14,692	7,833	82,260	2,749	1,711
Uncompahgre Plateau	77,795	55,497	196,626	43,824	32,047
Grand Total	**275,423**	**176,663**	**945,732**	**117,566**	**86,558**

[1]Potentially affected areas: includes all commercial and noncommercial activities in Priority Treatment Areas, hazard tree removal areas, and area affected by new roads outside PTAs.

[2]This is all modeled Red-naped Sapsucker summer cover and foraging habitat for the GMUG National Forests based on the GMUG 2014 MIS Assessment (http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3837155.pdf)

The action alternatives may temporarily displace individuals through habitat alteration and/or disturbance, but these effects will not result in a change in population numbers or trends at the Forest scale. Over time, aspen stands are expected to regenerate which will provide healthier aspen stands that are more resilient to sudden aspen decline in the future.

Other ongoing actions occurring in aspen will continue to have some negative effect to sapsuckers but these effects are expected to be minimal unless they directly affect mature aspen. Design features would minimize impacts to MIS, and in some cases, help achieve management objectives for those species. Increased age-class diversity in spruce and aspen would contribute to reduced vulnerability of the stands to insect and disease, as well as other stressors. Due to the relatively limited extent of acres potentially treated across the GMUG National Forests, no discernible changes to population levels are expected under any action alternative.

Effects of Alternatives 1

There will be no human-induced effects as a result of the No Action alternative. No treatments will occur and vegetation in the area would continue to be influenced by natural processes. Areas of aspen and willow vegetation are not affected by the spruce beetle epidemic. There would be no human-influenced or additive impacts since harvest and vegetation manipulation would not occur. No discernible change in population trends at the Forest level.

Aspen decline has stabilized at approximately 229,000 aces on the GMUG but affected stands continue to die with older, mature stands being most affected. Regeneration in affected aspen stands is much lower than what would be expected in healthy stands (Shepperd et al 2015). The lack of active management could reduce the amount of young aspen on the landscape which could affect sapsucker populations over time. However, the loss of overstory spruce due to beetle mortality in stands that also support aspen is expected to increase the amount of aspen in some areas. Active small scale treatment in aspen would continue, authorized by other decisions, but at a much lower level relative to the action alternatives.

Cumulative Effects to All Species – Alternatives 2 and 3

The list and description of cumulative effects for MIS is the same as listed in the cumulative effects section for sensitive species. All action alternatives are expected to cumulatively increase direct and indirect effects to habitat for all MIS analyzed. Over time, these effects will decrease

in magnitude as vegetation management activities implemented as part of SBEADMR are completed, and as forests regenerate and recover over time.

Cumulative Effects to All Species – Alternative 1

There will be no cumulative effects as a result of Alternative 1 because there are no treatments proposed to add to activities occurring in the past, present or future.

Migratory Birds

Neotropical migratory landbirds (NTMB) are birds that breed in the U.S. and winter in Mexico, Central and South America. Resident landbirds include those that remain during the winter period, or move to winter habitats that occur primarily within the U.S. border.

There are 37 Bird Conservation Regions (BCRs) in North America with four of these occurring at least partially in Colorado. The GMUG National Forests occurs within the Southern Rockies Colorado-Plateau Bird Conservation Region (BCR 16), Southern Rockies Physiographic Region 62. BCR 16 encompasses portions of Colorado, New Mexico, Arizona, Utah and Wyoming. Information from BCR 16 was synthesized for use in Colorado through the development of the Birds of Conservation Concern list (U.S. Fish and Wildlife Service 2008) and the Colorado Landbird Conservation Plan (Beidleman 2000).

Potential influences on migratory birds were tiered to conservation objectives at the Forest-Wide scale and BCR 16 (additional information on BCR 16 is available online at: http://www.nabci-us.org/bcrs.htm). Table 36 lists Birds of Conservation Concern for BCR 16, their status within the project area, and projected influence from the SBEADMR project. The Bird Conservancy of the Rockies (http://www.birdconservancy.org/) monitors many of these species to acquire population information. These migratory birds will continue to be tracked through the Bird Conservancy of the Rockies Integrated Monitoring in Bird Conservation Regions (IMBCR) Program, which includes monitoring units on the Forest, to determine population trends over time.

Table 36. FWS Birds of conservation concern for BCR 16 and anticipated influence of alternatives.

Species	General Habitat	Occurrence in Analysis Area	Effect of Alternatives
Northern Harrier	Grasslands	No	Evaluated as an R2 sensitive species; No Effect (No habitat present).
Swainson's Hawk	Grasslands	No	No Effect (No habitat present)

Ferruginous Hawk	Prairie	No	Evaluated as an R2 sensitive species; No Effect (No habitat present)
Golden Eagle	Cliffs/grasslands	No	No Effect; No known nests.
Peregrine Falcon	Cliffs	No	Evaluated as an R2 sensitive species; No Effect.
Prairie Falcon	Cliffs	No	No Effect. (No known nests near project areas).
Gunnison sage-grouse	Sagebrush	Yes	Evaluated as a threatened species in the Biological Assessment for ESA compliance. The Biological Assessment made a May Affect, not likely to adversely affect, determination since there will be some noncommercial treatments occurring in designated critical habitat where critical habitat overlaps forested areas near forest-sagebrush interfaces. Treatments will be implemented to achieve objectives from the Gunnison Sage-Grouse Range-wide Conservation Plan. Treatments will also avoid areas of sagebrush habitat .

Snowy Plover	Shorelines	No	No Effect (No habitat present)
Mountain Plover	Prairie	No	No Effect. (No habitat present).
Solitary Sandpiper	Shorelines	No	No Effect (No habitat present).
Marbled Godwit	Wetlands	No	No Effect (No habitat present).
Wilson's Phalarope	Waterbodies/ Shorelines	No	No Effect (No habitat present).
Yellow-billed Cuckoo	Deciduous Riparian	No	No Effect. (No habitat present).
Flammulated Owl	Aspen/Conifer mixed forest; Ponderosa pine/snags	Yes	Evaluated as an R2 sensitive species; May impact, due to direct disturbance and habitat effects.
Burrowing Owl	Plains/grasslands	No	Evaluated as an R2 sensitive species; No Effect. (No habitat present)
Short-eared Owl	Parks/grasslands	No	No Effect. (No habitat present).
Black Swift	Waterfalls/wet cliffs	No	Evaluated as an R2 sensitive species; No Effect. (No habitat present)
Lewis's Woodpecker	Riparian Cottonwood	No	Evaluated as an R2 sensitive species; No Effect (No known occurrences or suitable habitat in affected areas).
Williamson's Sapsucker	Montane forests/ snags	Yes	May impact, due to direct disturbance and habitat effects.

Gray Vireo	Oak woodlands/scrub	No	No Effect. (No habitat present).
Pinyon Jay	Pinyon/Juniper	No	No Effect. (No habitat present).
Bendire's Thrasher	Rare species of arid areas	No	No Effect. (No habitat present).
Crissal Thrasher	No records in CO.	No	No Effect. (No habitat present).
Sprague's pipit	No records in CO.	No	No Effect. (No habitat present).
Virginia's warbler	Riparian shrub	No	No Effect. No impact upon this habitat type.
Black-throated gray warbler	Oak scrub/riparian	No	No Effect. (No habitat present).
Grace's warbler	Ponderosa pine	No	No Effect. (No habitat present).
Sage sparrow	Sagebrush	No	No Effect. (No habitat present).
Chestnut-collared longspur	Plains	No	No Effect. (No habitat present).

The Colorado Landbird Conservation Plan (Beidleman 2000) identified priority species and habitats for each physiographic area in the state, based on the Partners-In-Flight Species Prioritization Process. Priority habitats identified for the Southern Rocky Mountains Physiographic Area include: alpine tundra, aspen, cliff/rock, high elevation riparian, lowland riparian, mixed-conifer, mountain shrubland, ponderosa pine, sagebrush shrubland, spruce-fir, and wetlands. Table 37 shows the habitat types that occur within the SBEADMR project action area.

Table 37: Priority habitats and species of the Southern Rocky Mountains province and their relationship to assessment for the SBEADMR action area.

Priority Habitat Type	**BCP Priority Species**	**BCP Potential Issues(s)**	**Potential Influence from Project Activities**	**Effect of Alternatives**
Aspen	Red-naped sapsucker Purple martin Violet-green swallow	Grazing, snag habitat, Altered disturbance regimes	Yes	Red-naped sapsucker evaluated as GMUG MIS; Decrease in mature aspen from coppice treatments; decrease in snags and potential for direct mortality.
High Elevation Riparian	Cordilleran flycatcher American dipper MacGillivray's warbler Wilson's warbler	Grazing, Recreation impacts	Yes	Minimal influences to the species anticipated from disturbance associated with human activity/equipment use and noise effects. No habitat effects anticipated due to design criteria in place to protect riparian areas.
Mixed Conifer	Dusky grouse Williamson's sapsucker Flammulated owl	Altered disturbance regimes, snags, timber mgmt.	Yes	Flammulated owl evaluated as R2 Sensitive Species: May Impact Individuals; Decrease in snags for sapsucker and Flammulated owl and potential for direct mortality.

Spruce/ Fir	Boreal owl Olive-sided flycatcher Hammond's flycatcher	Timber mgmt., snags, altered disturbance regimes	Yes	Boreal Owl and Flycatcher evaluated as R2 Sensitive Species: May Impact Individuals. Hammonds flycatcher = decrease in snags and potential for direct mortality.

Summary of Effects of Alternatives on Migratory Birds

This project will comply with Forest Plan Standards and Guidelines to retain snags for nesting structures. This project will also incorporate conservation measures and principles, as appropriate, from local bird conservation plans (North American Bird Conservation Initiative) and/or other references into project design so that adverse effects are minimized (USDA Forest Service and USDI Fish and Wildlife Service 2008 – MOU Between the USDA Forest Service and the USFWS to Promote the Conservation of Migratory Birds).

A decrease in snag habitat and potential for direct mortality mainly upon nestlings is likely for these species due to treatments proposed for the action alternatives. Project design features are in place to: retain sufficient snags consistent with Forest Plan direction; protect known active bird nests and cavities; and minimize potential mortality since project activities are unlikely to be implemented during the spring nesting period for many of the migratory birds (May – June) since this time period coincides with wet soil conditions resulting from spring snowmelt (Standard Provision BT5.12 specifies that use of system roads and temporary roads by the timber purchaser will be authorized by the Forest Service when such use will not cause damage to the roads or Forest resources; and Design Feature TSHR-4 states that timber hauling will be restricted during wet or thawed conditions when needed to protect the road surface).

Activities associated with the action alternatives - ***May Impact Individuals, but are not likely to cause a trend towards Federal listing or result in loss of viability in the planning area.***

General Wildlife

Table 38 below lists the wildlife observed in the action area by GMUG NF wildlife biologists during field visits conducted in previous years for other projects, and species documented in the action area from other data sources (Forest Service Natural Resource Manager Wildlife Database; Colorado Parks and Wildlife – Colorado Species Occurrence and Abundance Tool; and Colorado Natural Heritage Program). This list is not all inclusive as it is primarily based on general field observations from the above sources.

Table 38. Wildlife documented in the SBEADMR Action Area.

BIRDS		
American Robin	Gray Jay	Red-breasted Nuthatch
Northern Goshawk (sensitive and MIS)	Hairy Woodpecker	Red Crossbill
Sharp-shinned Hawk	Hermit Thrush	Ruby-crowned Kinglet
Brown Creeper	House Wren	Steller's Jay
Chipping Sparrow	Mountain Bluebird	Townsends Solitaire
Cooper's Hawk	Mountain Chickadee	Warbling Vireo
Dark-eyed Junco	Northern Flicker	Red-tailed Hawk
Downy Woodpecker	American Three-toed Woodpecker	White-crowned Sparrow
Dusky Grouse	Pine Grosbeak	Wilson's Warbler
Golden-crowned Kinglet	Pine Siskin	Broad-tailed Hummingbird
Western Wood-Pewee	Hammond's Flycatcher	Boreal Owl (sensitive)
Lincoln's Sparrow	Olive-sided Flycatcher (sensitive)	Purple Martin (sensitive)
Flammulated Owl (sensitive)	Red-naped Sapsucker (MIS)	Williamson's Sapsucker
MAMMALS		
Black Bear	Moose	Southern Red-Backed Vole
Canada Lynx (threatened)	Mountain Lion	Red Squirrel
Bighorn Sheep (sensitive)	Mule Deer	Snowshoe Hare
Elk (MIS)	American Marten (sensitive and MIS)	Chipmunk
Porcupine	Pika	Red Fox
Yellow-bellied Marmot	Bobcat	Mouse
Golden-mantled Ground Squirrel	Bushy-tailed Woodrat	Mountain Cottontail
Long-tailed Weasel		

Amphibians		
Boreal Toad (sensitive)	Northern Leopard Frog (sensitive)	Chorus Frog
Tiger Salamander		

Habitat quality for different animal species is based on a combination of many different factors, which is characteristic of the inherent variability, complexity, and uncertainty associated with ecosystems. Most notably, wildlife habitat quality is based on vegetative composition and structure (Thomas et al. 1979) and the influence of threats from anthropogenic and natural disturbances. The structure and composition of the forest affects food availability and cover (Smith 2000); in turn the availability of food and cover is affected by changing landscape patterns. Species may respond to landscape patterns in different ways depending on their habitat needs (Gergel and Turner 2002). Natural processes, such as fire, forest insect (most notably the spruce beetle epidemic associated with this project) and disease outbreaks, and wind, in conjunction with management activities all contribute to changing landscape patterns and all create vegetation mosaics. These mosaics create habitat heterogeneity, or discontinuity, across a landscape which is important for maintaining faunal diversity (Smith 2000). Although some discontinuity is generally positive, at some level (which is different for each species), heterogeneity becomes habitat fragmentation (Smith 2000). Importantly, management actions that manipulate land cover, including timber harvest and prescribed fire, may have contrasting effects on different wildlife species because habitat improvements for some species may lead to a decrease in habitat quality for others (Smith 2000, Gergel and Turner 2002).

Species that are habitat generalists may be the least impacted from the action alternatives, while those that are habitat specialists may be the most impacted. As noted above, the spruce beetle outbreak is a natural disturbance event currently influencing the landscape on the GMUG NF. Project activities would be additive, and cumulatively would be expected to have direct and indirect impacts to these species, their habitat, and their prey species. Impacts include temporary disturbance potentially leading to displacement for some species, possible direct mortality of some individuals, reductions in habitat quality within treatment areas for some species (particularly species using snags and requiring overstory forest canopy), and habitat improvements for others particularly species that utilize edge habitat and openings. Areas of Biodiversity Significance, as identified by the Colorado Natural Heritage Program (http://www.cnhp.colostate.edu/download/scorecard.asp) are avoided by the action alternatives. In the existing environmental baseline, some woodpecker species such as the American three-toed woodpecker (Figure 3) and hairy woodpecker benefitted from the spruce beetle outbreak and experienced high population densities.

Figure 3 *American three-toed woodpecker observed in the action area. Matt Vasquez - Gunnison Ranger District wildlife biologist.*

In Summary: Selection of either action alternative would result in a change in habitat conditions, but is not likely to adversely affect population trends for general wildlife at the GMUG NF scale. Alternative 3 would have less direct and indirect impacts to habitat and individuals than alternative 2 due to fewer miles of new road construction and activities being confined to the WUI. The most important factor currently affecting the environmental baseline is the natural disturbance from the spruce beetle epidemic, which has varying effects to these species in both the short and long term. Activities associated with the action alternatives are additive, but in terms of habitat effects resulting from commercial and noncommercial treatments, there would not be significant changes affecting habitat conditions at the land-scape scale (scale of GMUG NF and Geographic Areas).

RECOMMENDED CONSERVATION MEASURES TO AVOID, MINIMIZE, OR MITIGATE ADVERSE EFFECTS

There are no recommended conservation measures beyond the design features described for SBEADMR.

RESPONSIBILITY FOR A REVISED BE/MIS REPORT

This report was prepared based on presently available information. If the action is modified in a manner that causes effects not considered, or if new information becomes available that reveals that the action may impact endangered, threatened, proposed, Forest Service sensitive, or management indicator species that in a manner or to an extent not previously considered, a new or revised Biological Assessment, Biological Evaluation and Management Indicator Species report will be required.

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APPENDICES

Appendix A – Maps
Appendix B – Silvicultural and Fire Matrices
Appendix C – Design Features
Appendix D – Impacts Related to Design Features
Appendix E – Cumulative Impacts by Watershed and Geographic Area

APPENDIX A – Maps

Figure A-1. Red-naped sapsucker habitat potentially affected by alternative 2.

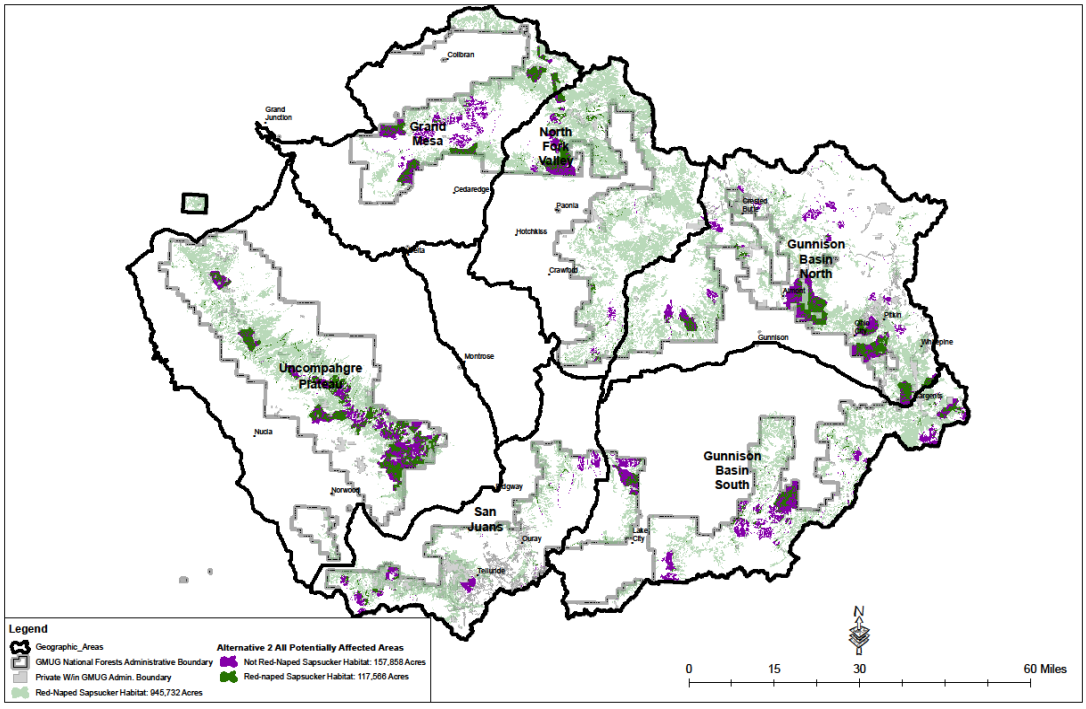


Figure A-2. Red-naped sapsucker habitat potentially affected by alternative 3.

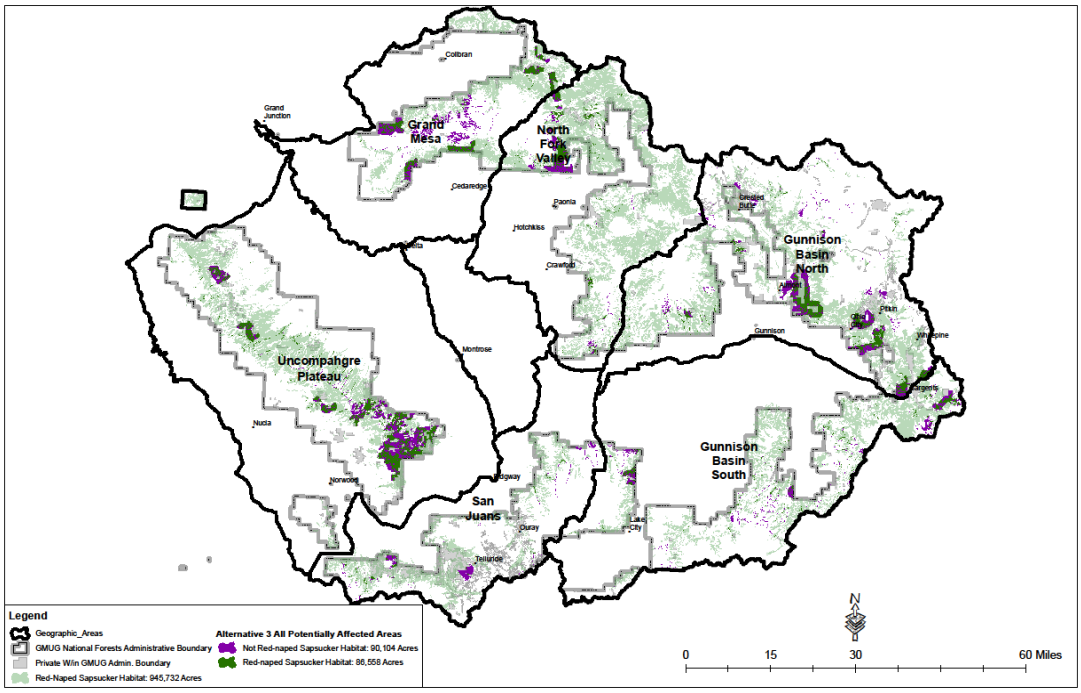


Figure A-3. Northern goshawk habitat potentially affected by Alternative 2

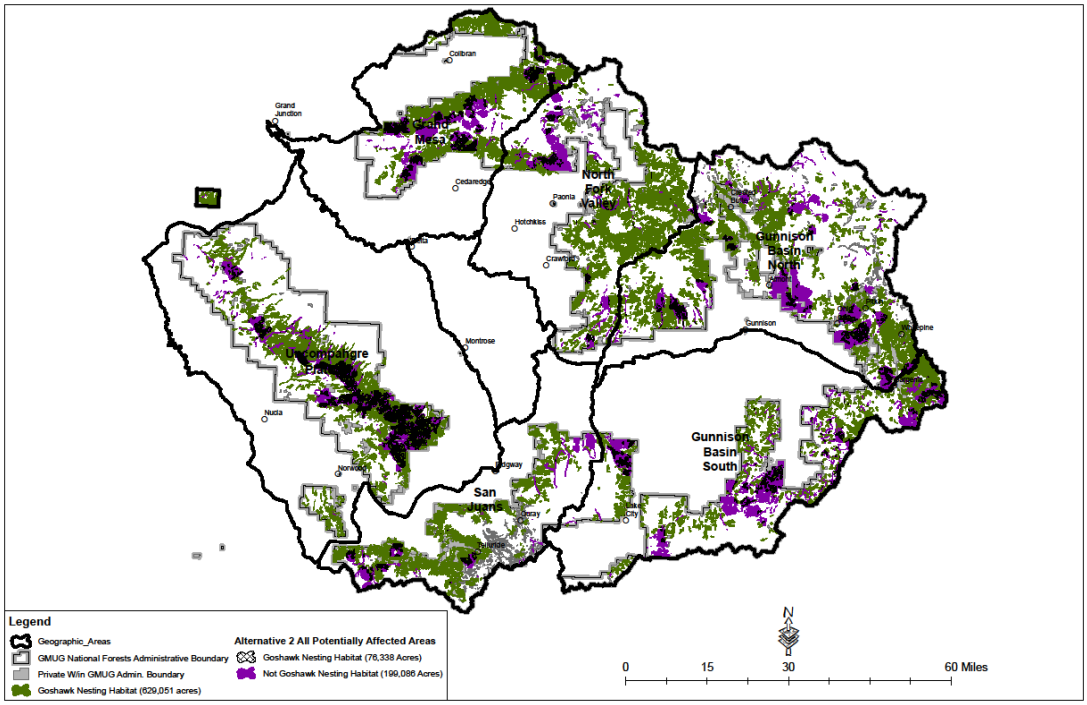


Figure A-4. Northern goshawk habitat potentially affected by Alternative 3

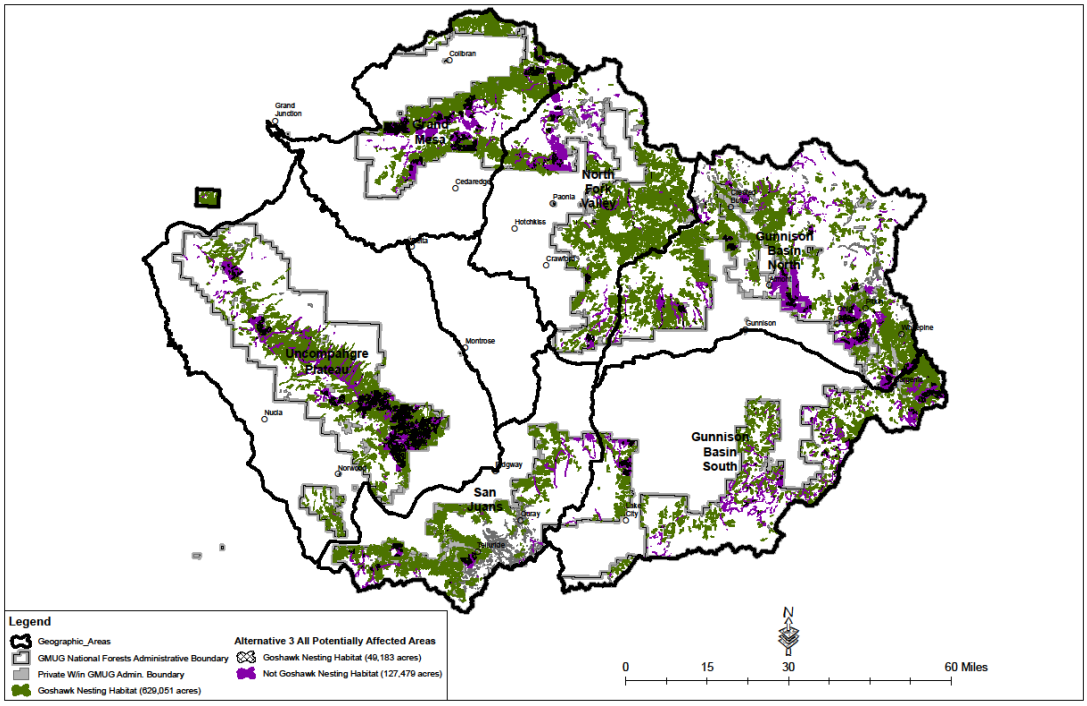


Figure A-5. American marten habitat potentially affected by Alternative 2.

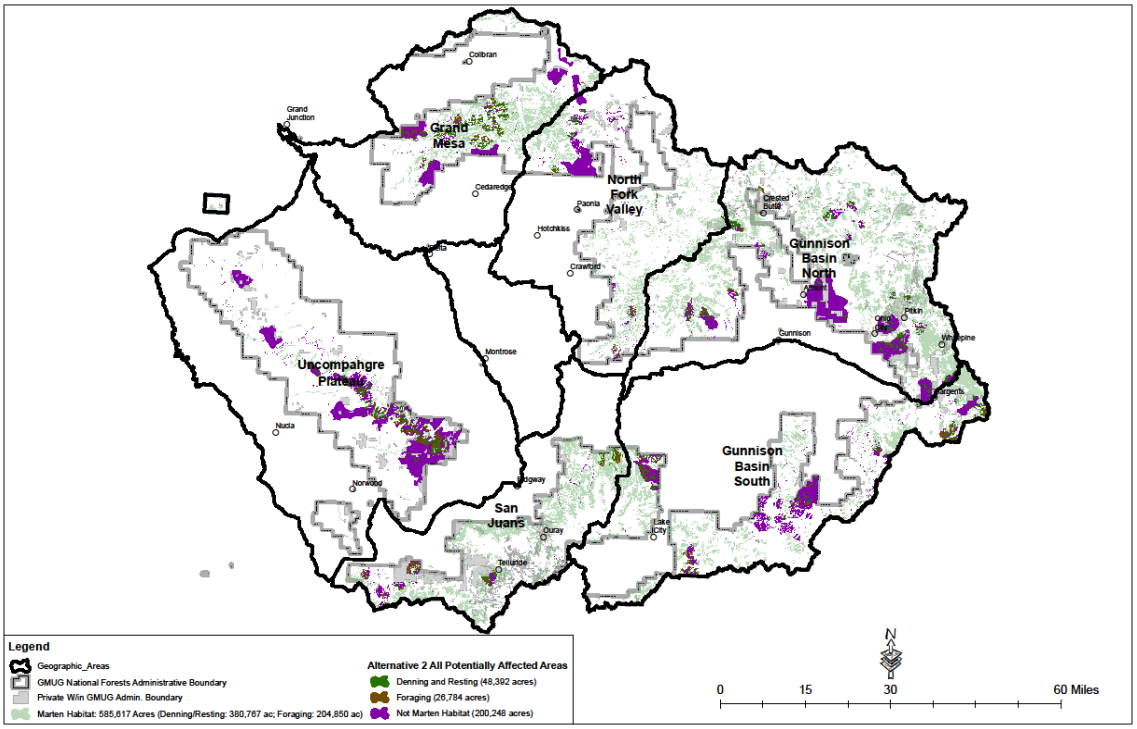


Figure A-6. American marten habitat potentially affected by Alternative 3.

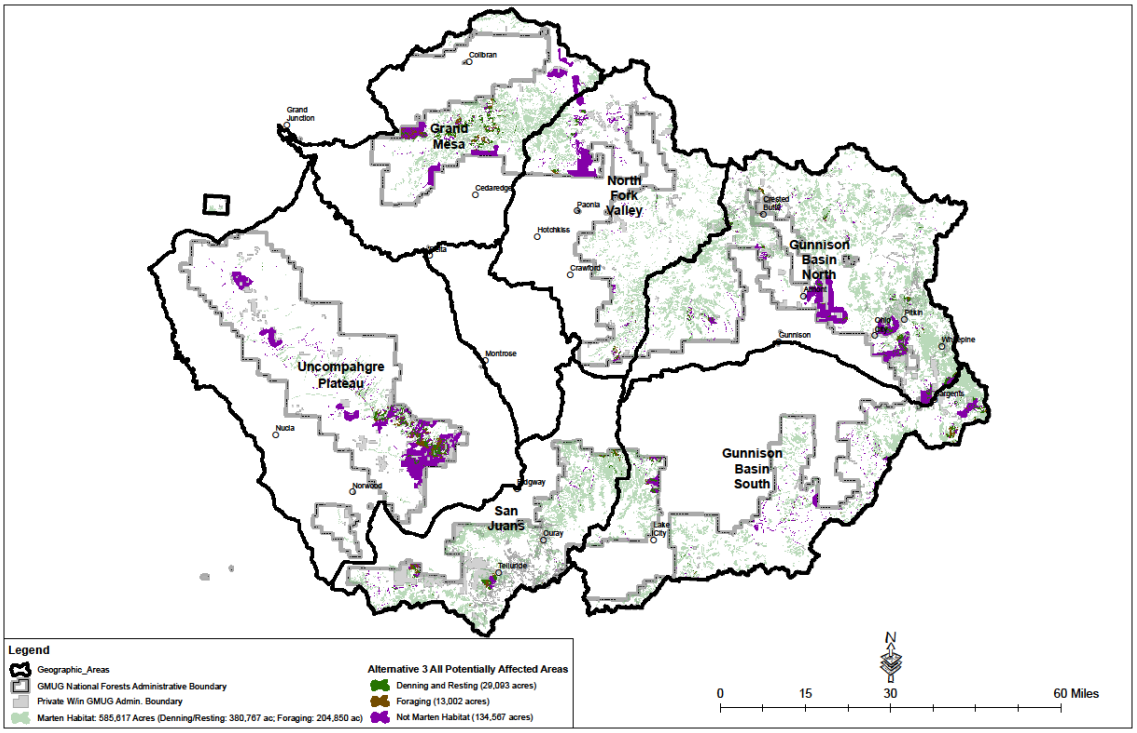


Figure A-7. Overlap of Elk Winter Concentration Areas with Haul Routes

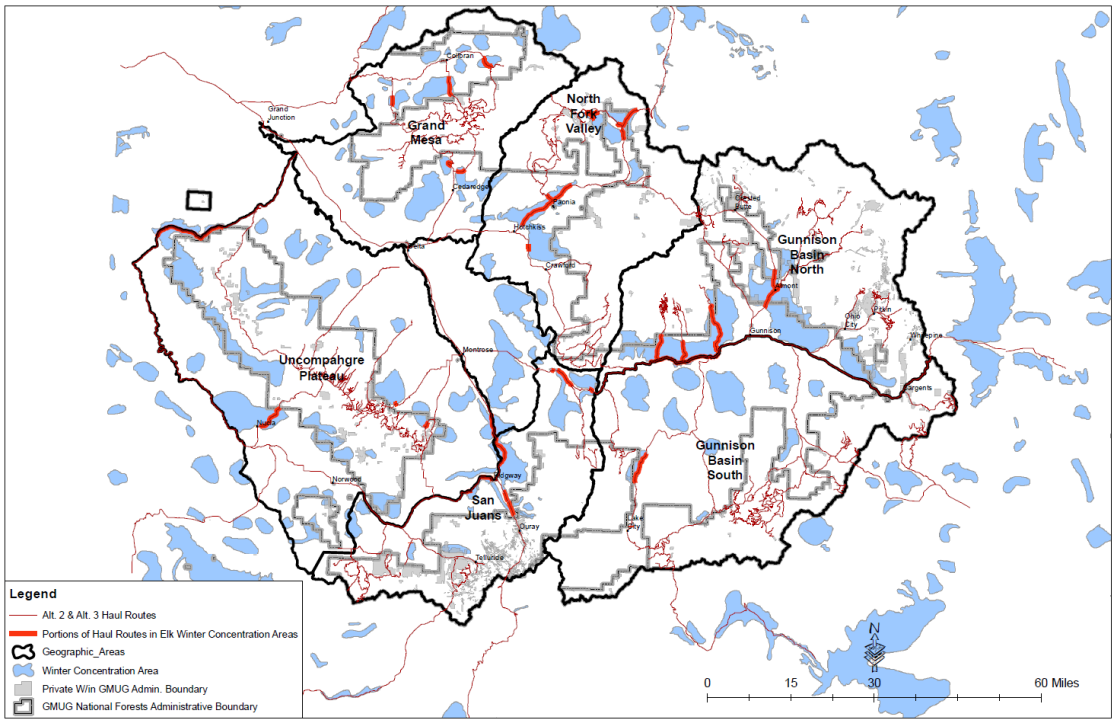


Figure A-8. Overlap of Elk Production Areas with Affected Areas from Alternatives 2 and 3

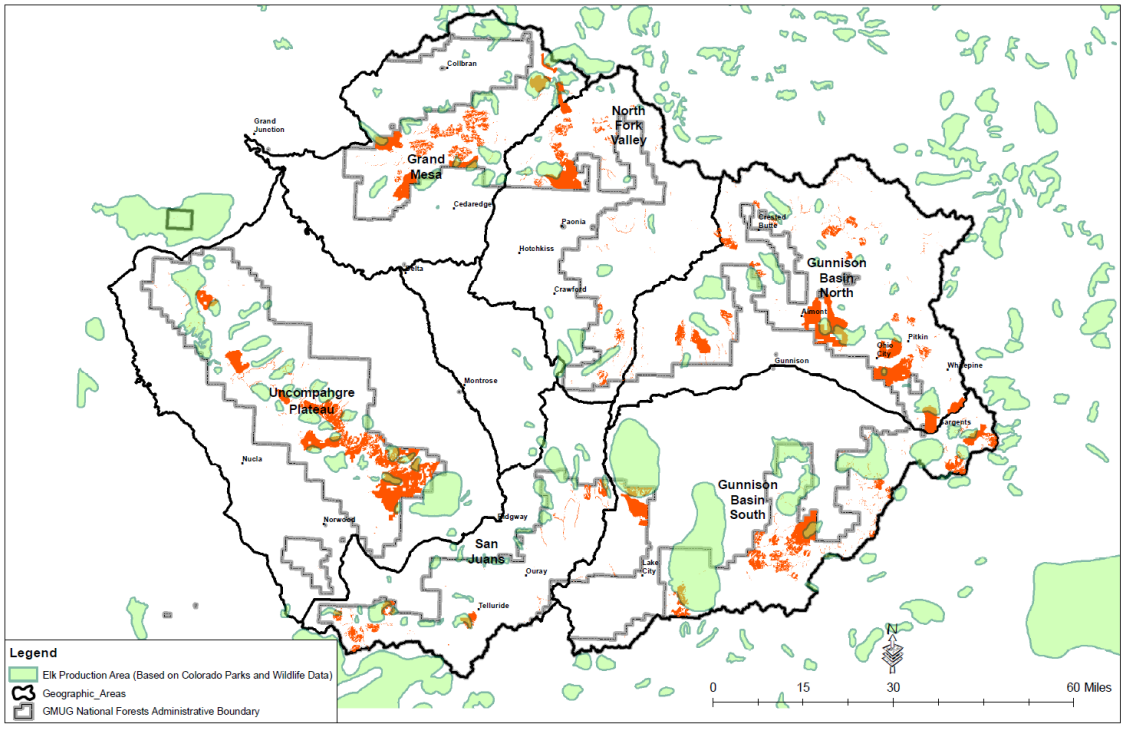


Figure A-9. Comparison of Baseline to Alternatives 2 and 3, identifying watersheds where the Forest Plan Standards for habitat effectiveness are not met for the 4B management area.

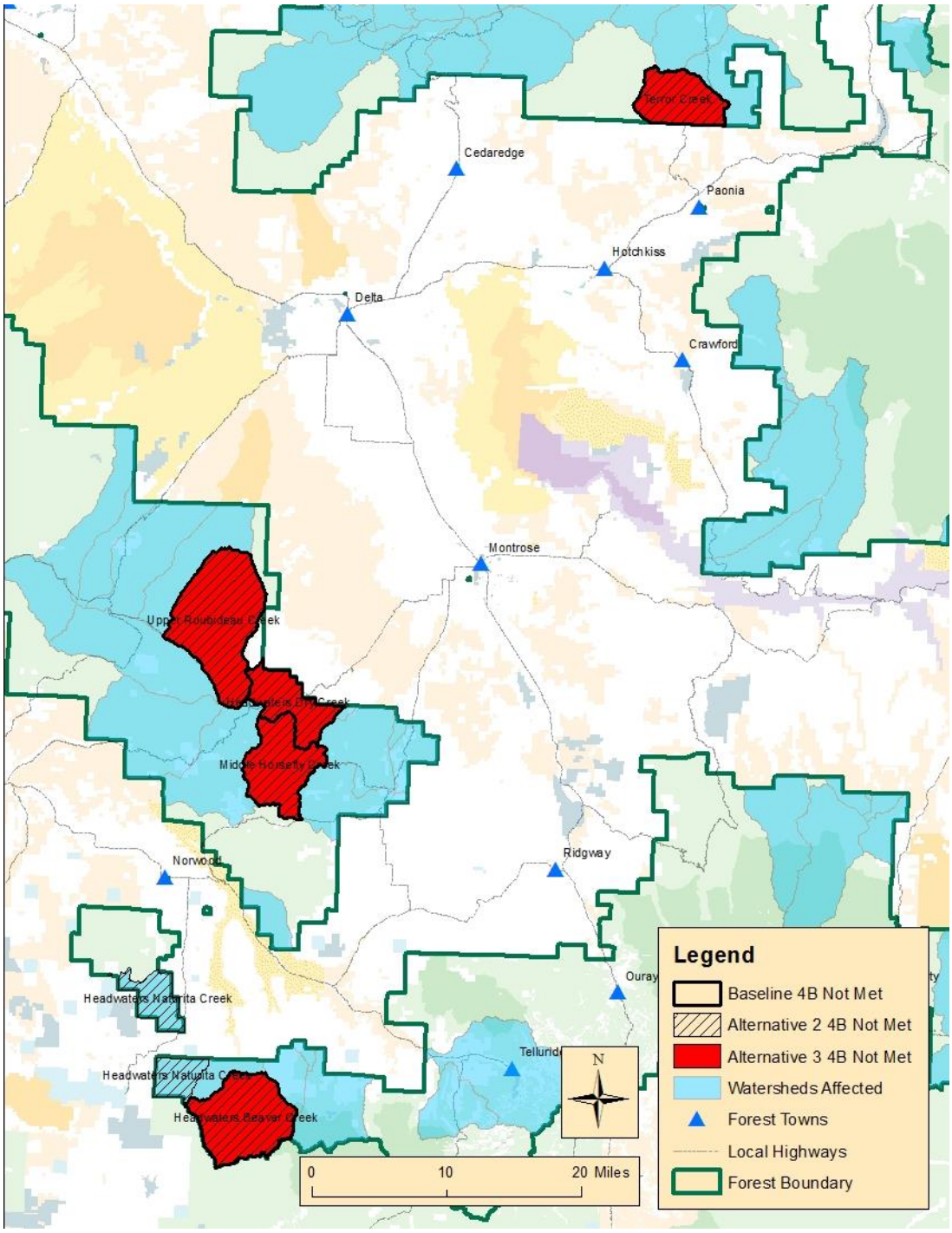
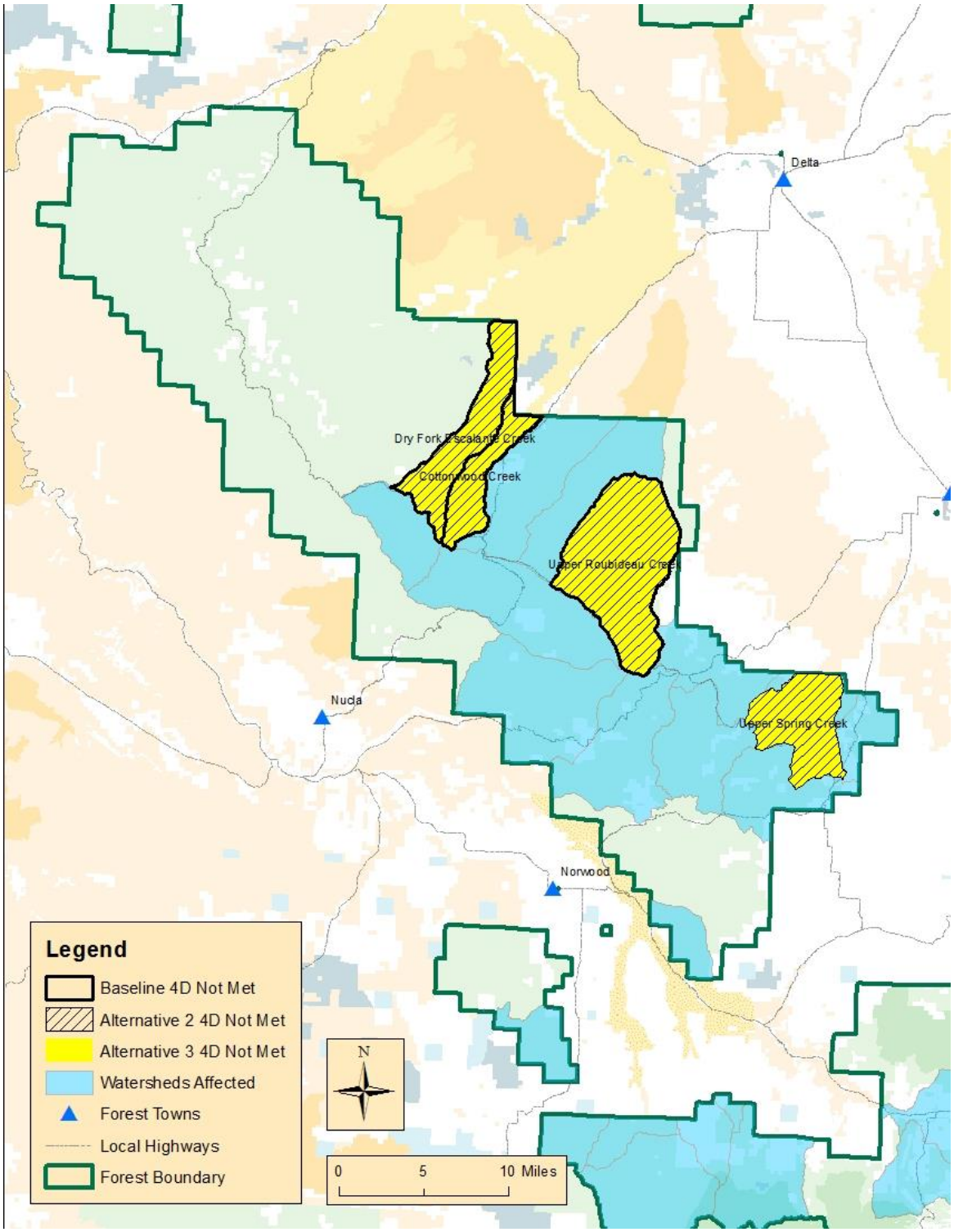


Figure A-10. Comparison of Baseline to Alternatives 2 and 3, identifying watersheds where the Forest Plan Standards for habitat effectiveness are not met for the 4D management area.



APPENDIX B – Silvicultural and Fire Prescription Matrices

Spruce Beetle Epidemic and Aspen Decline Management Response

Treatment objectives within the matrix are a combination of objectives for silvicultural, fuels, and wildlife programs to accomplish the identified SBEADMR purpose and need *(See Chapter 1).* During surveys for individual treatments, additional opportunities/objectives may be determined to enhance resources with the identified silvicultural treatment (example: opportunity to decrease existing soil compaction via decommission/rehabilitation of previously existing skid trails). During implementation, design features will be applied to minimize, avoid, or mitigate impacts to existing resources. See *Appendix B* for full list of design features.

Effects indicators common to each prescription are: vertical structure, horizontal cover, age-class, and species composition. These indicators will be monitored to determine effectiveness of the treatments to meet identified objectives. See *Appendix C.*

Due to the need to track lynx habitat in accordance with the Southern Rockies Lynx Amendment, pertinent lynx information for each prescription is included as well.

<table>
<tr><td rowspan="2">Spruce-fir Structural Stand Conditions</td><td colspan="2">Resiliency Rx</td><td colspan="2">Recovery and Resiliency Rx</td><td colspan="2">Recovery Rx</td></tr>
<tr><td colspan="2"><40% overstory mortality[1]</td><td colspan="2">>40% <90% overstory mortality[1] (exceeds windthrow threshold [3])</td><td colspan="2">>90% overstory mortality[1] (exceeds windthrow threshold [3])</td></tr>
<tr><td>Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.</td><td>Stand is multi-storied and <35% DHC[4].</td><td>Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.</td><td>Stand is multi-storied[2] and <35% DHC[4].</td><td>Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.</td><td>Stand is multi-storied[2] and <35% DHC[4].</td></tr>
<tr><td>Single-storied</td><td colspan="2">Objectives of treatment:
Generate and maintain multiple stories.
Maintain shade-tolerant species.
WUI: Decrease potential surface fire intensity via reduced surface fuels.</td><td colspan="2">Objectives of treatment:
Generate and maintain multiple stories.
Shift species composition toward drought-resistant, shade-intolerant species.</td><td colspan="2">Objectives:
Generate and maintain multiple stories.
Shift species composition toward drought-resistant, shade-intolerant species.</td></tr>
</table>

Spruce-fir Structural Stand Conditions	Resiliency Rx		Recovery and Resiliency Rx		Recovery Rx	
	<40% overstory mortality[1]		>40% <90% overstory mortality[1] (exceeds windthrow threshold [3])		>90% overstory mortality[1] (exceeds windthrow threshold [3])	
	Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.	**Stand is multi-storied and <35% DHC[4].**	**Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.**	**Stand is multi-storied[2] and <35% DHC[4].**	**Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.**	**Stand is multi-storied[2] and <35% DHC[4].**
	• WUI: Reduce potential for crown fire by reducing canopy continuity. **Silvicultural Rx:** Initiate UAM[4] using ITS[4] or group selection (<3 tree length – 0.25 to 2 acre openings). Removal centered on pockets of dead and dying. Harvest approximately 15 to 25% of the stand area with small openings tree lengths). Emphasis for group placement is in pockets of dead or dying trees. Individual tree selection will be conducted as needed to remove beetle affected trees in the matrix (areas between group selection openings). If needed, mechanical site preparation will be used to promote seed germination and seedling survival. Maintain "wind firmness" by removing no more than 40% of the present stocking within the matrix. Trees with active beetle life forms in the tree will be considered for removal. Live trees, older dead trees and recently killed trees will be retained to maintain 60% of the original stocking. These stands generally lack understory vegetation (trees), but it may be present in isolated pockets within stands		• WUI: Decrease potential surface fire intensity via reduced surface fuels. • WUI: Reduce potential for crown fire by reducing canopy continuity. **Silvicultural Rx:** Remove all dead-dying Spruce-fir and plant where adequate seed sources are lacking – Combination of Group Select where mortality is patchy to larger CC[4] where mortality is extensive. If needed, mechanical site preparation will be used to promote seed germination and seedling survival. Where mortality is patchy, create small openings (0.25 to 2 acres or <3 tree lengths) otherwise removal of the entire stand may be needed. In areas where the entire stand will not be removed, maintain "wind firmness" by removing no more than 40% of the present stocking within the matrix. These stands generally lack understory vegetation (trees), but it may be present in isolated pockets within stands		• WUI: Decrease potential surface fire intensity via reduced surface fuels. **Silvicultural Rx:** Remove majority of dead-dying spruce-fir* and plant where adequate natural seed sources are lacking. Larger CC[4] will be used where mortality is extensive. If needed, mechanical site preparation will be used to promote seed germination and seedling survival. These stands generally lack understory vegetation (trees), but it may be present in isolated pockets within stands Minimize or avoid to the extent practicable impacts to advanced regeneration during layout and operations. Focus on protecting high quality advanced regeneration (>35% DHC) in blocks of 0.3 acres or larger. **Lynx Habitat:** If 90% or greater of the overstory is dead or projected to be dead in two years due to high levels of beetle infestation, may be considered unsuitable	

Spruce-fir Structural Stand Conditions	Resiliency Rx		Recovery and Resiliency Rx		Recovery Rx	
	<40% overstory mortality[1]		**>40% <90% overstory mortality[1] (exceeds windthrow threshold [3])**		**>90% overstory mortality[1] (exceeds windthrow threshold [3])**	
	Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.	**Stand is multi-storied and <35% DHC[4].**	**Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.**	**Stand is multi-storied[2] and <35% DHC[4].**	**Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.**	**Stand is multi-storied[2] and <35% DHC[4].**
	Minimize or avoid to the extent practicable impacts to advanced regeneration during layout and operations. Focus on protecting high quality advanced regeneration (>35% DHC) in blocks of 0.3 acres or larger where it occurs. **Lynx Habitat:** suitable. **SRLA[5]:** Stand is not multi-storied and therefore not subject to cap restrictions.		Minimize or avoid to the extent practicable impacts to advanced regeneration during layout and operations. Focus on protecting high quality advanced regeneration (>35% DHC) in blocks of 0.3 acres or larger where it occurs. **Lynx Habitat:** suitable. **SRLA[5]:** Stand is not multi-storied and therefore not subject to cap restrictions.		lynx habitat if it lacks a live green understory (Southern Rockies Lynx Amendment Implementation Guide Page 16). The goal is to protect high quality, >35% advanced regeneration to the maximum extent practicable. **SRLA[5]:** Stand is not multi-storied and therefore not subject to cap restrictions. *Subject to snag retention and other applicable design features in Appendix B.	
Two-storied *(considered multi-storied under SRLA)*	**Objectives:** • Generate and maintain multiple stories. • Maintain shade-tolerant species. • WUI: Decrease	**Objectives:** • Generate and maintain multiple stories. • Maintain shade-tolerant species. • WUI: Decrease	**Objectives:** • Generate and maintain multiple stories. • Maintain shade-tolerant species. • WUI: Decrease	**Objectives:** • Generate and maintain multiple stories. • Shift species compositi on toward drought-resistant,	**Objectives:** • Generate and maintain multiple stories. • Maintain shade-tolerant species. • WUI: Decrease	**Objectives:** • Generate and maintain multiple stories. • Shift species compositi on toward drought-resistant,

Spruce-fir Structural Stand Conditions	Resiliency Rx		Recovery and Resiliency Rx		Recovery Rx	
	<40% overstory mortality[1]		>40% <90% overstory mortality[1] (exceeds windthrow threshold [3])		>90% overstory mortality[1] (exceeds windthrow threshold [3])	
	Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.	**Stand is multi-storied and <35% DHC[4].**	**Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.**	**Stand is multi-storied[2] and <35% DHC[4].**	**Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.**	**Stand is multi-storied[2] and <35% DHC[4].**
 **(Continued) Two-storied** *(considered multi-storied under SRLA)* 	potential surface fire intensity via reduced surface fuels. • WUI: Reduce potential for crown fire by reducing canopy continuity. • Within 200' of infrastructure in WUI reduce potential for crown fire and ember sources by reducing ladder fuels.	potential surface fire intensity via reduced surface fuels. • WUI: Reduce potential for crown fire by reducing canopy continuity. • Within 200' of infrastructure in WUI reduce potential for crown fire and ember sources by reducing ladder fuels.	potential surface fire intensity via reduced surface fuels. • WUI: Reduce potential for crown fire by reducing canopy continuity. • Within 200' of infrastructure in WUI reduce potential for crown fire and ember sources by reducing ladder fuels	shade-intolerant species. • WUI: Decrease potential surface fire intensity via reduced surface fuels. • WUI: Reduce potential for crown fire by reducing canopy continuity. • Within 200' of infrastructure in WUI reduce potential for crown fire and ember	potential surface fire intensity via reduced surface fuels. **Silvicultural Rx:** Stand no longer considered two-story due to dead overstory. Overstory removal (salvage) of dead and dying. Minimize or avoid to the maximum extent practicable impacts to live advanced regeneration during layout and operations. Focus on protecting high quality advanced regeneration (>35% DHC) in blocks of 0.3 acres or larger.	shade-intolerant species. • WUI: Decrease potential surface fire intensity via reduced surface fuels. **Silvicultural Rx:** Stand no longer considered two-story due to dead overstory. Overstory removal (salvage) of dead and dying. Minimize or avoid to the maximum extent practicable impacts to live advanced regeneration during layout and operations. Focus on protecting high

Spruce-fir Structural Stand Conditions	Resiliency Rx		Recovery and Resiliency Rx		Recovery Rx	
	<40% overstory mortality[1]		**>40% <90% overstory mortality[1] (exceeds windthrow threshold [3])**		**>90% overstory mortality[1] (exceeds windthrow threshold [3])**	
	Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.	**Stand is multi-storied and <35% DHC[4].**	**Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.**	**Stand is multi-storied[2] and <35% DHC[4].**	**Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.**	**Stand is multi-storied[2] and <35% DHC[4].**
	Silvicultural Rx: Initiate UAM[4] using ITS[4] or group selection 0.25 to 2 acre openings (<3 tree lengths). Removal of Dead and dying. Removal centered on pockets of dead and dying. Minimize or avoid to the extent practicable impacts to advanced regeneration during layout and operations. Focus on protecting high quality advanced regeneration (>35% DHC) in blocks of 0.3 acres or larger. **Lynx Habitat:** suitable – high quality.	**Silvicultural Rx:** Initiate UAM[4] using ITS[4] or group selection 0.25 to 2 acre openings (< 3 tree lengths). Removal of Dead and dying. Minimize or avoid to the maximum extent practicable impacts to live advanced regeneration during layout and operations. Focus on protecting high quality advanced regeneration (>35% DHC) in blocks of 0.3 acres or larger. **Lynx Habitat:** suitable. Incidental damage must be addressed in the Biological Assessment but is	**Silvicultural Rx:** Overstory removal (salvage) of dead and dying. Where mortality is lower, use un-even-aged management prescriptions- patch cuts 0.25 to 2 acres openings (< 3 tree lengths) or individual tree selection centered on pockets of dead and dying. Removal may be more extensive where mortality is high. Live trees that pose a blow down risk may also be removed. Maintain "wind firmness" by not removing more than 40% of the present stocking within a residual stand. Minimize or avoid to the maximum extent	sources by reducing ladder fuels **Silvicultural Rx**: Overstory removal (salvage) of dead and dying. Where mortality is lower, use uneven-aged management prescriptions- patch cuts 0.25 to 2 acres openings (< 3 tree lengths) or individual tree selection centered on pockets of dead and dying. Removal may be more extensive where mortality is high. Live trees that pose a blow down risk may also be removed. Maintain "wind firmness" by not removing more than 40% of the	**Lynx Habitat:** Depends upon understory characteristics – if it provides suitable habitat for hares then it is considered suitable. **SRLA:** Incidental damage to advanced regeneration is tracked under VEG S1 and S2. VEG S6[5] does not apply when >90% of overstory is dead or dying. Where a live understory over average snow depth is present, incidental damage to habitat is estimated to be 25% of treated acres and 100% of new roads if they do not	quality advanced regeneration (>35% DHC) in blocks of 0.3 acres or larger. **Lynx Habitat:** Depends upon understory characteristics – if it provides suitable habitat for hares then it is considered suitable. **SRLA:** Incidental damage to advanced regeneration is tracked under VEG S1 and S2. VEG S6[5] does not apply when >90% of overstory is dead or dying. Where a live understory over average snow depth is present, incidental damage to habitat is estimated to be 25%

Spruce-fir Structural Stand Conditions	Resiliency Rx		Recovery and Resiliency Rx		Recovery Rx	
	<40% overstory mortality[1]		**>40% <90% overstory mortality[1] (exceeds windthrow threshold [3])**		**>90% overstory mortality[1] (exceeds windthrow threshold [3])**	
	Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.	**Stand is multi-storied and <35% DHC[4].**	**Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.**	**Stand is multi-storied[2] and <35% DHC[4].**	**Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.**	**Stand is multi-storied[2] and <35% DHC[4].**
	SRLA: [5] Track under Veg S1, S2, and S6[5]. Uneven-aged management prescription must be used and tracked under VEG S1 and S2. Incidental damage to advance regeneration is measured at 15% of the treated stand. Roads within treated units- included in incidental damage estimates from logging. Roads outside treatment units – 100% of the footprint of the road will be converted to stand initiation structural stage (SISS) – lynx habitat in an unsuitable condition. WUI treatments will be tracked under VEG S5 since they are intended to reduce	not tracked under VEG S6. [5] **SRLA:** Track under Veg S1 and S2. Uneven-aged management prescription must be used and tracked under VEG S1 and S2. Incidental damage to advance regeneration is measured at 15% of the treated stand. Roads within treated units- included in incidental damage estimates from logging. Roads outside treatment units – 100% of the footprint of the road will be converted to stand initiation structural stage (SISS) – lynx habitat in an unsuitable condition. WUI treatments will be	practicable impacts to live advanced regeneration during layout and operations. Focus on protecting high quality advanced regeneration (>35% DHC) in blocks of 0.3 acres or larger. **Lynx Habitat:** suitable – high quality. **SRLA: If** uneven-aged management prescription is used – track under VEG S1 and S2[5]. Incidental damage to advanced regeneration is measured at 35% of treated stand. Salvage or uneven-aged management prescription – track	present stocking within a residual stand. Minimize or avoid to the maximum extent practicable impacts to live advanced regeneration during layout and operations. Focus on protecting high quality advanced regeneration (>35% DHC) in blocks of 0.3 acres or larger. **Lynx Habitat:** suitable - incidental damage must be addressed in the Biological Assessment but is not tracked under VEG S6. **SRLA:** Uneven-aged management prescription – track under VEG S1 and	transverse a treatment unit.	of treated acres and 100% of new roads if they do not transverse a treatment unit.

Spruce-fir Structural Stand Conditions	Resiliency Rx		Recovery and Resiliency Rx		Recovery Rx	
	<40% overstory mortality[1]		**>40% <90% overstory mortality[1] (exceeds windthrow threshold [3])**		**>90% overstory mortality[1] (exceeds windthrow threshold [3])**	
	Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.	**Stand is multi-storied and <35% DHC[4].**	**Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.**	**Stand is multi-storied[2] and <35% DHC[4].**	**Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.**	**Stand is multi-storied[2] and <35% DHC[4].**
	seedling/sapling density.	tracked under VEG S5 since they are intended to reduce seedling/sapling density	under VEG S1, S2 and S6. Incidental damage to advanced regeneration is measured at 20% of treated stand. Roads within treatment units are included in incidental damage from logging. Roads outside treatment unit – 100% of the foot-print of the road will be converted to stand initiation structural stage (SISS) – lynx habitat in an unsuitable condition. Acres tracked under VEG S1, S2 and S6[5]. WUI treatments will be tracked under VEG S5 since they are intended to reduce	S2[5]. Incidental damage to advanced regeneration is measured at 20% of treated stand. Salvage or even-aged management prescription – track under VEG S1and S2. When an uneven-aged Rx is used, incidental damage to advanced regeneration is measured at 35% of treated stand. Roads within treatment units are included in incidental damage from logging. Roads outside treatment unit – 100% of the foot-print of the road will be converted to stand initiation structural stage (SISS) – lynx habitat		

Spruce-fir Structural Stand Conditions	Resiliency Rx		Recovery and Resiliency Rx		Recovery Rx	
	<40% overstory mortality[1]		>40% <90% overstory mortality[1] (exceeds windthrow threshold [3])		>90% overstory mortality[1] (exceeds windthrow threshold [3])	
	Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.	**Stand is multi-storied and <35% DHC[4].**	**Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.**	**Stand is multi-storied[2] and <35% DHC[4].**	**Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.**	**Stand is multi-storied[2] and <35% DHC[4].**
			seedling/sapling density	in an unsuitable condition. WUI treatments will be tracked under VEG S5 since they are intended to reduce seedling/sapling density		
Multiple canopy layers – three or more 	**Objectives:** • Generate and maintain multiple stories. • Maintain shade-tolerant species. • WUI: Decrease potential surface fire intensity via reduced	**Objectives:** • Generate and maintain multiple stories. • Maintain shade-tolerant species. • WUI: Decrease potential surface fire intensity via reduced	**Objectives:** • Generate and maintain multiple stories. • Maintain shade-tolerant species. • WUI: Decrease potential surface fire intensity via reduced	**Objectives:** • Generate and maintain multiple stories. • Shift species compositi on toward drought-resistant, shade-intolerant species. • WUI: Decrease potential surface	**Objectives:** • Generate and maintain multiple stories. • Maintain shade-tolerant species. • WUI: Decrease potential surface fire intensity via reduced	**Objectives:** • Generate and maintain multiple stories. • Shift species compositi on toward drought-resistant, shade-intolerant species. • WUI: Decrease potential surface

Spruce-fir Structural Stand Conditions	Resiliency Rx		Recovery and Resiliency Rx		Recovery Rx	
	<40% overstory mortality[1]		**>40% <90% overstory mortality[1] (exceeds windthrow threshold [3])**		**>90% overstory mortality[1] (exceeds windthrow threshold [3])**	
	Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.	**Stand is multi-storied and <35% DHC[4].**	**Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.**	**Stand is multi-storied[2] and <35% DHC[4].**	**Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.**	**Stand is multi-storied[2] and <35% DHC[4].**
	surface fuels. • WUI: Reduce potential for crown fire by reducing canopy continuity. • Within 200' of infrastructure in WUI reduce potential for crown fire and ember sources by reducing ladder fuels. **Silvicultural Rx:** Initiate UAM[4] using ITS or group selection patch cuts 0.25 to 2 acre openings (<3 tree lengths). Removal centered on pockets of dead and dying. Minimize or avoid to the extent practicable impacts	surface fuels. • WUI: Reduce potential for crown fire by reducing canopy continuity. Within 200' of infrastructure in WUI reduce potential for crown fire and ember sources by reducing ladder fuels. **Silvicultural Rx:** Initiate UAM using ITS[4] or group selection patch cuts 0.25 to 2 acre openings (< 3 tree lengths). Removal centered on pockets of dead and dying. Minimize or avoid to the extent practicable impacts to advanced	surface fuels. • WUI: Reduce potential for crown fire by reducing canopy continuity. Within 200' of infrastructure in WUI reduce potential for crown fire and ember sources by reducing ladder fuels. **Silvicultural Rx:** If two canopies remain alive the stand is still considered multi-storied. Overstory removal (salvage) of dead and dying. Where mortality is lower, use un-even-aged management prescriptions – patch 0.25 to 2 acre openings (<3 tree	fire intensity via reduced surface fuels. • WUI: Reduce potential for crown fire by reducing canopy continuity. Within 200' of infrastructure in WUI reduce potential for crown fire and ember sources by reducing ladder fuels. **Silvicultural Rx**: If two canopy remains alive the stand is still considered multi-storied. Overstory removal (salvage) of dead and dying. Where mortality is lower, use un-even-	surface fuels. • Within 200' of infrastructure in WUI reduce potential for crown fire and ember sources by reducing ladder fuels. **Silvicultural Rx:** If two canopy remains alive the stand is still considered multi-storied. Overstory removal (salvage) of dead and dying. Minimize or avoid to the maximum extent practicable impacts to live advanced regeneration during	fire intensity via reduced surface fuels. • Within 200' of infrastructure in WUI reduce potential for crown fire and ember sources by reducing ladder fuels. **Silvicultural Rx:** If two canopy remains alive the stand is still considered multi-storied. Overstory removal (salvage) of dead and dying. Minimize or avoid to

Spruce-fir Structural Stand Conditions	Resiliency Rx		Recovery and Resiliency Rx		Recovery Rx	
	<40% overstory mortality[1]		>40% <90% overstory mortality[1] (exceeds windthrow threshold [3])		>90% overstory mortality[1] (exceeds windthrow threshold [3])	
	Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.	**Stand is multi-storied and <35% DHC[4].**	**Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.**	**Stand is multi-storied[2] and <35% DHC[4].**	**Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.**	**Stand is multi-storied[2] and <35% DHC[4].**
	to advanced regeneration during layout and operations. Focus on protecting high quality advanced regeneration (>35% DHC) in blocks of 0.3 acres or larger. **Lynx Habitat:** Suitable – high quality **SRLA:** Track under Veg S1, S2 and S6[5]. Uneven-aged management prescription must be used and tracked under VEG S1 and S2. Incidental damage to advance regeneration is measured at 15% of the treated stand. Roads within treated units- included in incidental damage	regeneration during layout and operations. Focus on protecting high quality advanced regeneration (>35% DHC) in blocks of 0.3 acres or larger. **Lynx Habitat:** Suitable– incidental damage must be addressed in the Biological Assessment but is not tracked under VEG S6[5]. **SRLA:** Track under Veg S1 and S2. Uneven-aged management prescription must be used and tracked under VEG S1 and S2. Incidental damage to advance regeneration is measured at 15% of	lengths) or individual tree selection centered on pockets of dead and dying. Removal may be more extensive where mortality is high. Live trees that pose a blow down risk may also be removed. Maintain "wind firmness" by not removing more than 40% of the present stocking within a residual stand. Minimize or avoid to the maximum extent practicable impacts to live advanced regeneration during layout and operations. Focus on protecting high quality advanced regeneration (>35% DHC) in blocks of 0.3 acres or larger.	aged management prescriptions- patch cuts 0.25 to 2 acre openings (<3 tree lengths) or individual tree selection centered on pockets of dead and dying. Removal may be more extensive where mortality is high. Live trees that pose a blow down risk may also be removed. Maintain "wind firmness" by not removing more than 40% of the present stocking within a residual stand. Minimize or avoid t the maximum extent practicable impacts to live advanced regeneration during layout and operations. Focus on protecting high quality advanced regeneration (>35%	layout and operations. Focus on protecting high quality advanced regeneration (>35% DHC) in blocks of 0.3 acres or larger. **Lynx Habitat:** depends upon understory characteristics – if it provides suitable habitat for hares then it is considered suitable. **SRLA:** Incidental damage to advanced regeneration is tracked under VEG S1 and S2. VEG S6[5] does not apply when >90% of overstory is dead or dying.	the maximum extent practicable impacts to live advanced regeneration during layout and operations. Focus on protecting high quality advanced regeneration (>35% DHC) in blocks of 0.3 acres or larger. **Lynx Habitat:** depends upon understory characteristics – if it provides suitable habitat for hares then it is considered suitable. **SRLA:** Incidental damage to advanced regeneration is tracked under VEG S1 and S2[5]. VEG S6[5] does not apply when >90% of

Spruce-fir Structural Stand Conditions	Resiliency Rx		Recovery and Resiliency Rx		Recovery Rx	
	<40% overstory mortality[1]		>40% <90% overstory mortality[1] (exceeds windthrow threshold [3])		>90% overstory mortality[1] (exceeds windthrow threshold [3])	
	Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.	**Stand is multi-storied and <35% DHC[4].**	**Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.**	**Stand is multi-storied[2] and <35% DHC[4].**	**Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.**	**Stand is multi-storied[2] and <35% DHC[4].**
	estimates from logging. Roads outside treatment units – 100% of the footprint of the road will be converted to stand initiation structural stage (SISS) – lynx habitat in an unsuitable condition. WUI treatments will be tracked under VEG S5 since they are intended to reduce seedling/sapling density	the treated stand. Roads within treated units- included in incidental damage estimates from logging. Roads outside treatment units – 100% of the footprint of the road will be converted to stand initiation structural stage (SISS) – lynx habitat in an unsuitable condition. Road acres tracked under VEG S1, S2. WUI treatments will be tracked under VEG S5 since they are intended to reduce seedling/sapling density	**Lynx Habitat:** Suitable – high quality. **SRLA:** Uneven-aged management prescription – track under VEG S1 and S2[5]. Incidental damage to advanced regeneration is measured at 20% of treated stand. Salvage or even-aged management prescription – track under VEG S1, S2 and S6. Incidental damage to advanced regeneration is measured at 20% of treated stand. Roads within treatment units are included in incidental damage from logging. Roads outside	DHC) in blocks of 0.3 acres or larger. **Lynx Habitat:** Suitable - incidental damage must be addressed in the Biological Assessment but is not tracked under VEG S6[5]. **SRLA:** Uneven-aged management prescription – track under VEG S1 and S2. Incidental damage to advanced regeneration is measured at 20% of treated stand. Salvage or even-aged management prescription – track under VEG S1and S2[5]. When even-aged Rx is used, incidental damage	Where a live understory over average snow depth is present, incidental damage to habitat is estimated to be 25% of treated acres and 100% of new roads if they do not transverse a treatment unit. WUI treatments will be tracked under VEG S5 since they are intended to reduce seedling/sapling density **Note**: If the stand has at two or more living layers the Veg S6 standard still applies. This will be determined at the project-level.	overstory is dead or dying. Where a live understory over average snow depth is present, incidental damage to habitat is estimated to be 25% of treated acres and 100% of new roads if they do not transverse a treatment unit. WUI treatments will be tracked under VEG S5 since they are intended to reduce seedling/sapling density **Note:** If the stand has at two or more living layers the Veg S6 standard still applies. This will be determined at the project-level.

Spruce-fir Structural Stand Conditions	Resiliency Rx		Recovery and Resiliency Rx		Recovery Rx	
	<40% overstory mortality[1]		>40% <90% overstory mortality[1] (exceeds windthrow threshold [3])		>90% overstory mortality[1] (exceeds windthrow threshold [3])	
	Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.	**Stand is multi-storied and <35% DHC[4].**	**Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.**	**Stand is multi-storied[2] and <35% DHC[4].**	**Stand multi-storied[2] and averages ≥35% DHC[4] and advanced regeneration are above mean snow depth.**	**Stand is multi-storied[2] and <35% DHC[4].**
			treatment unit – 100% of the foot-print of the road will be converted to stand initiation structural stage (SISS) – lynx habitat in an unsuitable condition. Road acres tracked under VEG S1, S2. WUI treatments will be tracked under VEG S5 since they are intended to reduce seedling/sapling density	to advanced regeneration is measured at 20% of treated stand. Roads within treatment units are included in incidental damage from logging. Roads outside treatment unit – 100% of the foot-print of the road will be converted to stand initiation structural stage (SISS) – lynx habitat in an unsuitable condition. Acres tracked under VEG S1 and S2**[5].** WUI treatments will be tracked under VEG S5 since they are intended to reduce seedling/sapling density		

[1] Percent overstory mortality – amount of overstory trees (all species) that are dead or dying. Trees that are infected by beetles (bark colored boring dust in bark crevices and around base of standing trees) and are expected to die within 2 years will be considered dead or dying.

[2] Multi-storied spruce-fir – the SRLA amendment defines as at least two layers of live vegetation layers combined with an overstory that provides at least 40% live canopy (mature overstory) closure.

[3] Removal and/or mortality of approximately ≥40% live stand overstory increases likelihood for windthrow in remaining stand overstory.

[4] Definitions: DHC = dense horizontal cover, D&D = dead & dying, ITS = individual tree selection, UAM = uneven-aged management, CC = clear-cut.

[5] SRLA = Southern Rockies Lynx Amendment, VEG S1 = standard that applies to vegetation management treatments that regenerate forested lands (Attachment 1-2 of the SRLA Record of Decision), VEG S2 = standard that applies to timber management projects that regenerate forests except for fuel treatment projects in WUI (Attachment 1-3 SRLA Record of Decision) , VEG S6 = standard that applies to all vegetation management projects within multi-story mature to late successional conifer forests (Attachment 1-4 of the SRLA Record of Decision).

Uneven-aged Vegetation Management

Uneven-aged management is recognized as a proactive approach to mimic natural gap dynamics that maintain or encourage multi-story attributes while accomplishing other resource management objectives. Gaps are created naturally in the canopy of stands from small bug infestations, diseases, blowdown pockets of trees, and other natural influences.

The general principle of uneven-aged vegetation management, as identified in Exception 4 in VEG S6, is the small group selections that consist of small forest openings (approximately 1-2 acres in size) in which the openings created by group selection will not exceed 20 percent of a stand in a single entry, but individual tree selection can occur throughout an entire stand or between the groups. Therefore, uneven-aged treatments will approximate natural succession and disturbance processes while maintaining and providing habitat conditions that support lynx and snowshoe hare through time in both the stand initiation structural stage and in mature, multi-story conifer vegetation (VEG O1 and O2). Additionally, uneven-aged treatments will be focused in areas that have the potential to improve winter snowshoe hare habitat but presently have poorly-developed understories that lack dense horizontal cover (VEG O4).

Aspen Structural Stand Conditions	Objectives	Suckering Potential High	Suckering Potential Low	SRLA Vegetation Management Direction	Detailed Prescription
Aspen without SAD or <50% SAD *(Aspen without SAD lesser priority for regeneration objectives)*  	➢ Stimulate robust sprouting of aspen and create a younger stand more resilient to SAD. The goal is to mimic natural disturbance patterns resulting from a stand replacing event. ➢ WUI: Decrease potential surface fire intensity via reduced surface fuels	➢ Coppice harvest cut if tree defect is low to high. ➢ Can be prescribe burned if harvest cut site access is limited, however these sites are unlikely to support broadcast burns unless there is a moderate fine fuel component.	No Treatment	If mapped as secondary habitat (within 300m of primary spruce-fir habitat) impacts must be addressed in the BA. SRLA does not limit regeneration harvest prescriptions in aspen.	Remove all live aspen trees from the stand to trigger sprouting (coppice) to re-establish pure stand of aspen growing in open conditions. Make units large or have multiple smaller units in the same general area to minimize effect of browsing from wild ungulates and domestic livestock. If additional protection from browsing is needed, consider fencing or leaving slash in place that is not near infrastructure. Pile or broadcast burning to reduce residual slash Broadcast burning in these types of stands to remove some overstory trees and stimulate regeneration, though not feasible in every situation, is still a viable treatment in stands where fine fuel such as grass, leaf litter, and brush, are present, particularly in the fall when vegetation is curing. These stands are not a priority for broadcast burning but

					stand-specific opportunities do exist and should be utilized.
Aspen with >50% SAD 	• **Stands in WUI:** if site conditions indicate potential for treatment success, there is long - term value in trying to maintain some aspen on the landscape to reduce fire risk to the adjacent WUI. • **Stands outside WUI:** Defer treatment.	Research has indicated that treatments in aspen with >50% overstory mortality are generally not effective at promoting regeneration, so treatment-specific prescription would be based on additional information indicating a likelihood of treatment success.	➢ Defer & allow stand to follow natural successional pathway of sparse aspen/shrub field. ➢ Intensive management by planting a site-adapted conifer species may be an option.	If mapped as secondary habitat (within 300m of primary spruce-fir habitat) impacts must be addressed in the BA. SRLA does not limit regeneration harvest prescriptions in aspen.	Research has indicated that treatments in aspen with >50% overstory mortality are generally not effective at promoting regeneration so treatment-specific prescription would be based on additional information indicating a likelihood of treatment success.
Aspen overstory and Spruce-fir understory	**< 50% SAD** - Stimulate robust sprouting of aspen and create an even-aged stand structure. The goal is to mimic natural	**Mature aspen stand w/<50% SAD** ➢ Coppice harvest cut if defect low to high	➢ Defer aspen cut and allow stand to succeed to a Spruce-fir dominated stand.	If mapped as secondary habitat (within 300m of primary spruce-fir habitat) impacts must be addressed in the	**Mature aspen stand w/<50% SAD** - Remove all live aspen trees from the stand to trigger sprouting (coppice) and re-establish pure stand

	disturbance patterns resulting from a stand-replacing event. **>50% SAD –** • Stands in WUI: if site conditions indicate potential for treatment success, there is long-term value in trying to maintain some aspen on the landscape to reduce fire risk to the adjacent WUI. • Stands outside WUI: Defer treatment, allowing spruce-fir and other conifers to establish dominance within the stand.	➢ Use broadcast burning to stimulate additional aspen when appropriate ➢ Remove fir and aspen components to stimulate additional aspen ➢ WUI: Decrease potential surface fire intensity via reduced surface fuels **Young healthy aspen stand w/<50% SAD** ➢ Selective removal of fir component ➢ WUI: As necessary pile/burn the removed spruce/fir components to maintain low potential surface fire intensity		BA. SRLA does not limit regeneration harvest prescription in aspen. If the spruce-fir component in the stand creates a multi-storied condition then the level of harvest must be tracked under Veg S5.	of aspen growing in open conditions. Make units large enough in size (30-50 acres) or have multiple smaller units in the same general area to minimize effect of browsing from wild ungulates and domestic livestock. If additional protection from browsing is needed, consider fencing or leaving slash in place that is not near infrastructure. **Young healthy aspen stand w/<50% SAD –** Selective removal of spruce-fir to set back successional processes in the stand. Goal is to enhance aspen in treated stands. In areas where spruce-fir component is abundant and multi-storied, consider letting it succeed to a conifer-dominated stand to benefit Canada lynx. **Prescribed fire –** Utilize as needed to encourage aspen regeneration; low priority for broadcast burning. Broadcast burning these types of stands will be more difficult to accomplish than burning stands with aspen and dry mixed conifer or stands of ponderosa pine with aspen. Fires occurring in stands with spruce-fir can be stand-replacing

					and/or difficult to manage/control.
Mixed conifer with aspen	**Objectives**	**Suckering Potential High**	**Suckering Potential Low**	**SRLA Vegetation Management Direction**	**Detailed Prescription**
 Mixed conifer with aspen component. Plurality of species cover is Englemann spruce wirh aspen. Other conifer species includiing sub-apline fir, Douglas-fir, blue speruce, white fir, lodgepole pine and Ponderosa pine may aslo exist within the stand.	**Objectives:** • Shift species composition toward drought-resistant, shade-intolerant species. • WUI: Decrease potential surface fire intensity via reduced surface fuels. • WUI: Reduce potential for crown fire by reducing canopy continuity. • WUI: Stimulate aspen regeneration to reduce potential fire intensity	Coppice treatment to remove tree species in patches within the entire stand. Pile burn as needed to reduce fuels, provide areas for regneration and as directed by design features. Broadcast burn in and around mixed conifer stands with an aspen component depending on site conditions.	Remove spruce-fir / conifer and allow stand to succeed to aspen-dominated stand. Pile burn as needed to reduce fuels, provide areas for regneration and as directed by design features. Broadcast burn in and around mixed conifer stands with an aspen component depending on site conditions.	Depends upon on-the-ground conditions (e.g. multi-storied, live under-story above average snow depth, etc.). Harvest possibly tracked under VEG S1, S2 and / or VEG S6. .	Remove spruce and fir to favor shade-intolerant conifer species and aspen. **Prescribed fire-** Utilize pile burning and broadcast burning. Prescribe burn unit treatment area could be larger than the target stand in order to utilize adequate fire control lines – roads, trails, natural fuel breaks and constructed fire lines.

APPENDIX C – Design Features

Introduction

The design features were developed from laws, regulations, Forest Service Manual or Handbook policy, standard contract language, Forest Service-approved best management practices, or Forest Plan guidelines. These items are considered to be standard management practice as provided by the aforementioned sources, as they have been proven effective during implementation of similar vegetation treatments as proposed in this EIS. These features derive from decades-long practices and/or more recent best available science. These design features translate legal provisions and scientific principles into solid, commonsense stewardship actions that support continued sustainable resource use (USDA Forest Service 2006). They are listed by the functional area from which they arise.

During planning of a particular treatment authorized under the EIS, an interdisciplinary team (IDT) would be used to complete required surveys in accordance with Forest Plan and Region 2 policy requirements. The IDT would also complete treatment layout, including treatment units, location of roads, skid trails and landings, and identifying water influence zones. The team would also identify applicable treatment design features that would be applied to the treatment area. The Pre-Treatment Checklist, Appendix C, of the Final EIS would be used to document completed work. Forest Service staff specialists would sign off on completed work before it would be approved by the District Ranger.

Design features would be subject to change as a result of 1) change in policy or management direction (e.g. amendments or revision of the Forest Plan, federal listing of a species, etc.) and 2) best available science which indicates design feature should be modified or replaced to improve effectiveness. Potential changes would be evaluated during annual Management Reviews of SBEADMR implementation.

Some of the design features include more prescribed monitoring during treatment than others, and encompass explicit triggers for adaptive management. These features are marked in bold, below, and repeated in a "Decision-Making Triggers for Adaptive Implementation" table in Chapter 2.

Identifier	Design Feature	Source / Citation
Air Quality Objectives: Comply with Clean Air Act requirements.		
AQ-1	Prescribed burning operations will comply with the State of Colorado air quality regulations.	Clean Air Act
(TSHR-7)	Use suitable road surface stabilization practices and dust abatement supplements on roads with high or heavy traffic use (See FSH 7709.56 and FSH 7709.59).	FS National BMPs
Cultural Resources Objectives: The following Cultural Resources Design Features derived from the Programmatic Agreement will be implemented for Alternatives 2, 3 and 4. If these standard treatments are followed as described above, the proposed treatment will have no direct or indirect effects on cultural resources. Furthermore, under the SBEADMR S.106 Notification consultation with the Colorado State Historic Preservation Officer will have no adverse effect on historic properties (Claeyssens 2014).		
CR-1	Cultural resource surveys will occur prior to treatment implementation. All sites within a treatment area will be avoided until State Historic Preservation Office consultation may be completed. Archaeologist will consult with timber personnel with regards to site locations	2007 Programmatic Agreement for Bark Beetle, Hazardous Fuel and Tree Reduction Programs with Amendments
CR-2	Discoveries: If any new cultural resource sites are discovered during implementation, treatment activities would stop and the Forest Service archeologist would be contacted immediately. The archaeologist will evaluate the significance of the cultural resource. If potentially significant, within 48 hours of the discovery, the SHPO will be notified of the discovery and consultation will begin to determine an appropriate mitigation measure. The discovery will be protected from further disturbance until any required mitigation is completed. Operations may resume at the discovery site upon receipt of written instructions and authorization by agency officials.	2007 Programmatic Agreement for Bark Beetle, Hazardous Fuel and Tree Reduction Programs with Amendments.
CR-3	For all cultural resource sites located during the field inventory or previously known, no mechanical treatment or ground disturbing activities will occur within the site boundary, including an additional 50 foot buffer around the site. If mechanical treatments are necessary, the site and the 50 foot buffer around the site will be treated by hand to remove hazard trees and accumulated fuel build up.	Stipulation 5.B.b. ii and Stipulation 6.a and6 .b, Standard Treatments for Historic Properties, in the 2007 Programmatic Agreement for Bark Beetle, Hazardous Fuel and Tree Reduction Programs
CR-4	In areas slated for prescribed fire treatment, flammable cultural resource sites or sites with components or features susceptible to heat damage with the APE will be marked on the ground by an archeologist, along with a buffer area of no less than 50 feet, sufficient to prevent fire or heat from affecting components of the site that may contribute to its eligibility to the National Register of Historic Places. In addition, treatments may include fuel-breaks, no-treatment buffers, wrapping, foaming, wetting, blackline, fire line (hand or mechanical), and clearing the cultural resource sites of flammable debris by raking and hand removal.	USDA Forest Service, 2015

	Any fire line that will be ground disturbing will be subjected to an intensive field inventory; if any additional sites, components or features are located, the fire line will be adjusted to avoid these cultural resources.	
CR-5	If road construction cannot physically be relocated to avoid a site, and there is the potential for unidentified buried cultural remains, then SHPO consultation will take place and construction activities in the site boundaries would be monitored by an archaeologist.	USDA Forest Service, 2015
CR-6	Culturally Scarred Trees (CSTs) will be protected during mechanical treatments and to the extent possible, during underburns. Hand removal of fuels under CSTs will be conducted to the extent possible to reduce the risk of killing them during prescribed burning. However, no measures will be taken to create firelines or physically prevent burning around the CSTs.	USDA Forest Service, 2015
CR-7	Post-Treatment Monitoring: For treatments where field inventories are not feasible due to visibility concerns prior to treatment implementation, monitoring in the form of a sample inventory for cultural resources will be required post implementation. This monitoring will take place within one year of treatment implementation, with results provided to SHPO.	USDA Forest Service, 2015
CR-8	Post-Treatment Monitoring: Cultural resource sites that were required to be avoided during treatment implementation will be monitored for effectiveness of the protection measures following treatment completion.	USDA Forest Service, 2015
CR-9	Native American human remains: Any operator carrying out treatments must notify the Forest Service, by telephone, with written confirmation, immediately upon the discovery of human remains or funerary items, discovered on federal land. The Forest Service must then immediately notify appropriate tribes of the find. All treatment activities must stop in the vicinity of the discovery that could adversely affect it, until tribal consultation can be completed and a Plan of Action can be approved and implemented	NAGRPA regulation 43 CFR 10.4(g)

Forest Service Sensitive Plants

Objectives:
1. For Upland (non-wetland) Sensitive Species: Minimize impacts to individuals or populations that would lead to a loss in viability.
2. For all Sensitive Species: Minimize impacts to individuals or populations that would contribute to a loss in viability.
3. For Fen Sensitive Species*:
   a. Reduce potential for recreation-related resource damage to fens.
   b. Maintain fen hydrologic function (soil compaction, water diversion, dewatering) that would reduce suitability or sustainability of rare fen habitat.
   c. Prevent sedimentation events that would reduce or impair wetland functions.
4. For *Astragalus leptaleus*: Maintain functions of riparian wet or moist meadows.

**Carex diandra, Drosera rotundifolia,, E. chamissonis, E. gracile, Kobresia simpliciuscula, Salix candida, Sphagnum angustifolium, Utricularia minor*

FSSP-2	All Sensitive Species A - During prescribed fire operations (including aerial or ground broadcast burning), ignitions and other fuel treatment activities would be located away from sensitive plant species occurrences and wetlands. B - Dust abatement (use of $MgCl_2$ or $CaCl_2$) will avoid sensitive species occurrences and wetlands by 500 feet. C - Avoid sensitive species occurrences and wetlands with chemical weed treatments.	Elliott and others 2011, treatment- specific design

	E - Any Region 2 sensitive plant species new to list or located after contract or permit issuance will be appropriately managed by active coordination between permittee, contractor or purchaser, Forest Service line officer, treatment administrator, and botanist. F -Surveys will occur prior to implementation; Botanist will communicate with timber staff the location of any sensitive species found	
FSSP-3	*Machaeranthera coloradoensis* A - Minimize use of roads passing through known sensitive species sites.	Elliott and others 2011, treatment- specific design
FSSP-4	*B. paradoxum* B - If there is tree canopy covering habitat, maintain pre-treatment tree canopy over habitat.	Elliott and others 2011, treatment- specific design
FSSP-6	Fen sensitive species* A - Keep roads and trails out of wetlands and their water influence zones (WIZ). (1)B - Restore existing disturbed areas that are eroding and contributing sediment to the wetland. (WQSP-6A) – No mechanical equipment will be used within 100 feet of the edge of a fen.	(1) USDA Forest Service 2006. (2) USDA Forest Service 2006, 2012.
FSSP-7	Fen sensitive species* A – Treatment activities will avoid wetlands (see WQSP-6A) B – Mechanical treatment and vehicle use will occur outside of wetlands or their water influence zones. C- Prevent mineral sediment deposition from occurring in wetlands. (3)	(3) USDA Forest Service 2012, Austin 2008.
FSSP-8	Fen sensitive species* A - Develop an erosion and sediment control plan to avoid or minimize downstream impacts using measures appropriate to the site and the proposed activity. (3) B - Conduct prescribed fires to minimize the residence time on the soil while meeting the burn objectives. This is usually done when the soil and duff are moist. C - Limit roads and other disturbed sites to the minimum feasible number, width, and total length. Minimize sediment discharge into streams, lakes, & wetlands during construction and stabilize & maintain disturbed sites to control erosion. (1) D - Maintain sufficient upslope ground cover to prevent sediment movement downward into wetland.	1) USDA Forest Service 2006. (3) USDA Forest Service 2012, Austin 2008.
FSSP-9	*Astragalus leptaleus* A - Avoid treatment activities and equipment use in wet or moist meadows. B - Design stream crossings at armored points, or armor them to prevent loss of functions in wet or moist meadows.	Elliott and others 2011, treatment- specific design
FSSP-10	Upland (non-wetland) sensitive species A- Sensitive plant populations will be flagged and avoided for all ground disturbing activities with a buffer of 20 – 100 feet (as determined during treatment surveys). B- Proposed road construction, reconstruction, landings and staging areas in potential habitat for sensitive species will be designed and marked on the ground only after the areas have been surveyed by a qualified botanist in the proper season.	Professional judgment
Invasive Weeds Objective: Prevent new introductions of weeds or spread of existing infestations.		

IW-1	A - Consider excluding areas from prescribed burning where there are infestations of fire-proliferating species (example, cheatgrass).	
IW-2	Practices - Prevent the accidental spread of invasive species carried by contaminated vehicles, equipment, personnel, or materials. (2) A - Establish and implement standards and requirements for vehicle and equipment cleaning to prevent the accidental spread of aquatic and terrestrial invasive species on the treatment area. (1) Use standard timber sale contract provision WO-CT 6.36 to ensure appropriate equipment cleaning. Equipment cleaning should be conducted after working in areas with known infestations, and prior to bringing equipment onto the National Forest. B - Locate and use weed- free treatment staging areas. Avoid or minimize all types of travel through weed- infested areas, or restrict to those periods when spread of seed or propagules are least likely. (3) C - Workers need to inspect, remove, and properly dispose of weed seed and plant parts found on their clothing and equipment. Proper disposal means bagging the seeds and plant parts and incinerating them. (3) D - All imported materials (erosion control materials, soil, gravel, etc.) should be from a "weed-free" source or area.(3) E - Monitoring will occur where imported materials have been placed to ensure no new infestations have been established.	(1) Noxious weeds, that appear on the State of Colorado's noxious weed list (Colorado 2013) (2) FSM 2900. (3) USDA Forest Service 2001.
IW-3	Practices - Retain native vegetation to the extent possible to prevent weed germination and establishment, in and around activity area and keep soil disturbance to a minimum. (3) A - Timber purchasers and contractors will re-seed disturbed areas (as designated by the Forest Service) with an appropriate certified weed-free native seed mix (USDA Forest Service 2008) to avoid introduction of nonnative invasive plants and promote re-vegetation of native species. B - Throughout the implementation period of the proposed action, the Forest Service should maintain flexibility to defer cut units or stands within priority areas from treatment due to the discovery of significant new invasive plant populations with potential to disrupt the functioning of native plant communities. C - Where fuel reduction, timber harvest and other resource objectives necessitate ground disturbance and soil exposure, or substantial ground cover and canopy removal, include appropriate re-vegetation or invasive plant management strategies in treatment plan. (4) Where necessary, rehabilitate/restore or treat disturbed areas after management activities and conduct follow up monitoring on these areas susceptible to invasive plant spread. (4) D - Rehabilitate/restore or treat disturbed areas after fuel management activities and conduct follow up monitoring on these areas susceptible to invasive plant spread. (4) E - Cover and reduce exposure of bare ground. Use on-site chipping or treated fuels from mastication to cover bare soil to prevent seed establishment where appropriate. (4) See SV-4 concerning areas where mineral soil exposure would be needed to assist with natural regeneration. F- Slash and burn piles will be located away from known invasive plant populations and will be assessed for restoration and revegetation needs.	(3) USDA Forest Service 2001. (4) Cal-IPC Land Management BMPs. 2012

IW-4	Practices - Control and treat existing infestations to prevent treatment-associated spread and proliferation. A - Coordinate treatment activities with any nearby herbicide application to maximize cost effectiveness of nonnative invasive plant treatments. (3) B - Treatment of noxious weeds will follow Forest Service policy regarding certification of applicators and reporting of data to Forest Service data bases. C - Treatments of noxious weeds will follow the District Noxious Weed Treatment Decision Notice. D - Populations of noxious weeds should be aggressively treated with the appropriate management tools. This may include treatment with herbicides, grazing, cultural, and biological methods, consistent with the GMUG district decision notices.	(3) USDA Forest Service 2001.
IW-5	Within high risk areas for invasive plant species, complete inventories to identify invasive plant populations. Treat and document at least 50% efficacy rate prior to treatment and/or road-building.	USDA Forest Service, Region 2. 2015.
IW-6	Practices - Monitor project area for new infestations and to assess efficacy of treatments. A - Inspect and document all limited term ground-disturbing operations in infested areas for at least three growing seasons following completion of the project. For on-going projects, continue to monitor until reasonable certainty is obtained that no new infestations have occurred. Provide for follow-up treatments based on inspection results. B - Consider modifying design feature implementation for future project implementation based on considerations such as efficacy, cost, and other unforeseen impacts. C - Consider including other best practices for treatment-specific considerations.	Invasive Plant Data: The Rocky Mountain Region's Approach to Mapping and Recording Inventory and Treatment Data. October 2015.
Lands Objectives: 1. Avoid impacts to existing infrastructure from treatment activities. 2. Ensure treatments near electric infrastructure are conducted safely.		
L-1	Mechanical treatments used to remove dead and dying vegetation shall utilize equipment or operating techniques to ensure that debris cannot be thrown into electrical facilities causing damage or safety hazards.	Professional judgment
L-2	Coordinate prescribed fire treatment activities with utility ROW holders to ensure that facilities are not damaged by a fire that burns too hot or generates smoke dense enough to disrupt the transmission of electricity.	Professional judgment
L-3	When conducting hand treatments near energized facilities, non-electrical workers will observe the minimum approach distance.	Occupational Safety and Health Administration regulations provided in 29 CFR §1910.333.
L-4	Public Land Survey System corner preservation should be performed before any active or land disturbing management activity. This would include all known survey monuments, section corners, and other corner accessories.	Reference FSM-7150 and Timber sales Contract Division BT BT6.23

Range Objectives: 1. Eliminate conflicts between implementation activities and range activities, or mitigate for them. 2. Revegetate sites disturbed during implementation.		
RG-1	Coordinate with District Rangeland Management Specialists prior to developing sale and/or service contracts and/or burn plans to identify and mitigate any potential direct conflicts during implementation. Range personnel will be responsible for incorporating mitigation measures into grazing permittees' Annual Operating Instructions (for example, a pasture needs to be grazed earlier/later to avoid direct temporal overlap with timber sale activities).	GMUG Forest Plan
RG-2	Coordinate with District Rangeland Management Specialists prior to treatment to determine whether or not grazing deferment or pasture rest is needed, when deferment or rest is needed (prior to or following treatment), and for how long.	USDA FS. Rocky Mountain Region. 1996.
(IW-5)	Re-seeding: See IW-5.	
Recreation Objectives: 1. Coordinate potential conflicts between timing of treatment implementation and recreation use. 2. Seek opportunities to design treatments to benefit recreation residences, lodges, and organization camps in the vicinity of planned treatments.		
REC-1	Avoid use of broadcast burning treatments in campgrounds (if piles are burned ensure that impacts to residual trees are negligible).	Professional judgment
REC-2	Developed recreation sites: Managed by concessionaire: plans need to consider impact to summer operating season and should minimize impacts to operations as much as possible. For Forest Service operated sites: coordinate with District to address any District concerns regarding impact to the operating season.	Professional judgment
REC-3	Coordinate with District recreation staff regarding any treatment-related closures for developed recreation sites, dispersed recreation sites, trails and roads.	Professional judgment
REC-4	Special Uses: Work with recreation residences, lodges and organization camps to design treatments adjacent to these tracts to also treat these tracts to the extent feasible. Coordinate with District recreation staff to address treatment-related impacts to special use permit holders in the treatment area.	Professional judgment

Scenic Quality and Visual Resources

Objectives:

VQOs of Preservation (P) – only ecological changes are allowed. Management activities, except for very low visual-impact recreation facilities, are prohibited. This objective applies to Wilderness areas, primitive areas, other special classified areas, areas awaiting classification and some unique management units which do not justify special classification.

VQOs of Retention (R) – management activities must not be visually evident. They may only repeat form, line, color and texture which are frequently found in the characteristic landscape. Changes in their qualities of size, amount, intensity, direction, pattern, etc., should not be evident. Immediate reductions of contrast should be accomplished by means such as seeding vegetative clearing and cut-and-fill slopes, hand planting of large stock, painting structures, etc.

VQOs of Partial Retention (PR) – management activities must remain visually subordinate to the characteristic landscape. Activities may repeat form, line, color or texture common to the characteristic landscape. Changes in their qualities of size, amount, intensity, direction, pattern, etc., remain visually subordinate to the characteristic landscape. Actions may also introduce form, line, color, or texture which are found infrequently or not at all in the characteristic landscape, but should remain subordinate to the visual strength of the characteristic landscape. Reduction of contrast in form, line, color and texture to meet partial retention should be accomplished as soon as possible orwithin a year minimum.

VQOs of Modification (M) – management activities may visually dominate the original characteristic landscape. However, activities of vegetative and landform alteration must borrow from naturally established form, line, color or texture so completely and at such a scale that its visual characteristics are those of natural occurrences within the surrounding area or character type. Activities are predominantly introduction of facilities such as buildings, sighs, roads, etc. Reduction of contrast (or compliance with regional guidelines) should be accomplished in the first year.

VQOs of Maximum Modification (MM) – management activities may dominate the original characteristic landscape. However, when viewed as a background, the visual characteristics must be those of natural occurrences within the surrounding area or characteristic type. When viewed as foreground or middle ground, they may not appear to completely borrow from naturally established form, line, color or texture. Alterations may also be out of scale or contain details incongruent with natural occurances as seen in the foreground or middle ground. Activities are typically additional part of structures, roads, slash and root wads must be subordinate to proposed composition as viewed in the background. Reduction of contrast should be accomplished within five years.

Volume Two, Chapter 1: The Visual Management System, National Forest Landscape Management, Handbook 462, (Big Eye Book) pp 29 -- 37, .pdf, 4.08 MB

SVR-1	In developed recreation sites, including trailheads and administrative sites (typically Visual Quality Objectives [VQOs] of Modification or Maximum Modification), cut stumps as low to the ground as feasible. Remove or chip slash at developed campgrounds or designated recreation areas; extending outwards 200 feet of any constructed feature; at designated dispersed sites; and other dispersed sites deemed important at the time of implementation. Alternatively, at designated dispersed sites or other dispersed sites deemed important and at developed recreation sites (except developed campgrounds or designated recreation areas) and at administrative sites, move heavy slash to designated slash piles and burn as soon as conditions allow. Note: designated recreation areas include but are not limited to: Taylor Canyon, Mesa Lakes, Island Lake, and Amphitheatre/Na-Gach.	USDA Forest Service 2008. *Hazardous Tree Removal Project, Medicine Bow – Routt National Forests.* J. Tupala. Laramie, Wyoming; and Treatment- Specific Design in consultation with GMUG staff.
SVR-2	In developed recreation and administrative sites (typically VQOs of Modification or Maximum Modification), minimize damage, resulting from mechanical treatments, to mature trees already sprayed with insecticide for protection from bark beetle attack;	

	and to young healthy trees and understory trees and shrubs. Protect to provide present and future shade and screening, and to maintain high quality recreational setting and desired scenic condition.	
SVR-3	In areas of VQO Pristine or Preservation, where feasible, fresh cut ends of logs that are felled, but not removed, will be moved away from the trail. When cutting trees that fall across trails or within the trail corridor (generally 3 feet on either side of the trail), lop and scatter logs and limbs outside the corridor and remove heavy slash in the foreground and mid-ground (approximately 300 feet from edges) of roads and trails.	
SVR-4	In areas of Retention or Partial Retention, minimize damage to natural features such as rock outcrops, young healthy trees and understory of trees and shrubs; cut stumps as low to the ground as feasible. Note: Retention and Partial Retention should be applied to National Recreation Trails, National Scenic Trails, National Historic Trails and State or Forest Service Scenic Byways/All-American Roads.	
SVR-5	Revegetate and till disturbed and compacted soils on landings, burned slash pile sites, skid trails and temporary roads with native seed mixture after the completion of treatments to reduce soil contrast. Block access to decommissioned roads with naturalistic barriers to encourage regrowth.	
SVR-6	All designated trails (NRT, NST and NHT) and scenic byways must have heavy slash within the immediate foreground (not less than 25 feet from edges of roads and trails) removed to slash piles or chipped. Within 300 feet of these routes, if piles are burned, ensure that impacts to residual trees are negligible.	
SVR-7	For all treatments, revegetate and till disturbed and compacted soils on landings, burned slash pile sites, skid trails and temporary roads with native seed mixes after the completion of treatments. Block access to decommissioned or re-claimed temporary roads with naturalistic barriers.	LRMP
Silviculture Objectives: 1. For spruce beetle-affected stands: a. Provide for salvage of dead or dying stands b. Maintenance of green stands where they exist c. Regenerate stands where needed. 2. For stands to be treated for aspen decline: a. Regeneration of aspen before advanced decline, by either fire or mechanical removal b. Increase landscape resilience of aspen by ensuring that there are significant patches of young aspen c. Provide for aspen establishment 3. Shift toward drought tolerant early seral species where appropriate.		
SV-1	All regeneration cutting will meet stocking standards as defined in the Forest Plan.	GMUG Forest Plan
SV-2	All vegetation treatments, including prescribed fire, will be prescribed by a U.S. Forest Service, Region 2, Certified Silviculturist in accordance with applicable guidance from other resource specialists.	FSH 2409.17 Silvicultural Practices handbook

SV-3	To the greatest degree practicable given site fuels conditions, jackpot and pile burning would be used as acceptable methods to assist with natural regeneration strategies and to create mineral soil seedbeds for natural regeneration. Harvested areas would be evaluated for stocking.	R-2 FSH 2409.17 Silvicultural Practices Handbook
SV-4	During site preparation or piling activities, mineral soil exposure will be less than 40% of the treated area. Soil cover should be retained when practicable. To assist natural regeneration, conduct vegetation and fuels management activities to average 20 - 40% mineral soil exposure in post-harvest, as prescribed in the stand management prescription. On south slopes, mineral soil exposure would be less so that site moisture can better be retained. If the area has been identified as being high risk for invasive plants, or is known to have existing infestations, reduce soil exposure and consider artificial regeneration practices (planting).	Alexander 1987
SV-5	In order to reduce the risk of spruce beetles being drawn to uninfected trees, in stands with a component of live spruce which are not beetle-infected, felled spruce shall be removed from the sale area by no later than October 31 of the year felling occurs and unutilized spruce material (in excess of the 10-20 tons/acre required by the Forest Plan) that is cut during operations and greater than 6" diameter at the small end, but is not merchantable and left on site could be removed from the stand and taken to the landing. This will be considered yarding of un-merchantable material (YUM). When removal of non-merchantable material (YUM) is operationally infeasible, material would be debarked in stands, chipped or otherwise treated within the stand to reduce the likelihood of the material being utilized as brood material. Treatment of non-merchantable material will be prescribed by a certified silviculturist based on site specific conditions, with the overall goal being to reduce brood material.	Professional judgment of GMUG silviculturists and Forest Health Protection Staff.
SV-6	During any types of harvest in spruce-fir, areas of advanced regeneration will avoided to the greatest degree practicable while allowing feasible operations..	Professional judgment and standard operating procedure used by GMUG silviculturists.
SV-7	Broadcast burning for regeneration of spruce-fir stands should be limited to salvage operations in single-story stands with almost total spruce mortality; such stands have limited/no advanced regeneration. Targets for broadcast burning for regeneration in salvage-harvested, single-story spruce-fir stands would be creating patches of exposed mineral soil in up to 40% of the area to allow for spruce seed establishment mixed with some large residual material to provide shade to seedlings and seed sources within 300 feet of a majority of the unit. If the area has been identified as being high risk for invasive plants, or is known to have existing infestations, reduce bare mineral soil exposure and consider artificial regeneration practices (planting).	Professional judgment of GMUG silviculturists; Fire Effects Information System; Kilgore and Curtis 1987.
SV-8	In stands managed for aspen regeneration: a. Treatment units > 20 acres are preferred, to lessen effects of big game and livestock browsing. b. Minimize soil compaction by heavy equipment and haul trucks. c. Confine aspen treatments to suitable soils as much as possible. d. Give preference to sites in threatened and persistent aspen habitat zones (Worrall 2013). e. Use clear-felling (with fire as appropriate) to regenerate aspen stands for increased landscape resilience f. Choose timing of treatments, appropriate to recent extreme weather events.	Johnston 2001, Worrall 2013, Worrall et al. 2013
(RG-2)	Coordinate with District Rangeland Management Specialists prior to treatment to determine whether or not grazing deferment or pasture rest is needed, when deferment or rest is needed (prior to or following treatment), and for how long.	Professional judgment of GMUG silviculturists and rangeland management specialist.
(SP-1)	If the treatment unit is <100 acres and not near infrastructure or in management areas 1A, 1B or 1D, and aspen regeneration is the main goal, slash may be left on the ground to deter elk browse of aspen seedlings.	Professional judgment and standard operating

		procedure used by GMUG fuels managers.
Slash Piles Objectives: 1. Use current science and silvicultural, fuels and fire management practices to achieve an optimum balance between positive and negative effects of slash treatment on soils, hydrology, wildlife and potential fire risk. 2. Reduce negative impacts of fires.		
SP-1	• If the treatment unit is <100 acres and not near infrastructure or in management areas 1A, 1B or 1D, and aspen regeneration is the main goal, slash may be left on the ground to deter elk browse of aspen seedlings.	Professional judgment and standard operating procedure used by GMUG fuels managers.
SP-2	A minimum and maximum fuel loading will be specified in association with harvests and fuels treatments. Generate associated Brush and Disposal (BD) plan. This minimum and maximum will include any needs to reduce fuels near infrastructure and leave material onsite for seedling establishment, wildlife benefit and soils health.	Standard operating procedure used by GMUG silviculturists and fuel managers.
SP-3	In Management Areas 1A, 1B and 1D, (developed recreations sites, ski areas, utility corridors) enough harvest/activity-generated fuels will be removed so that residual fuel loading produce less than four foot flame lengths under 90% burning conditions . Slash piles will be burned by the Forest Service in accordance with agency protocols.	1991 Forest Plan Amendment, 8224GM, p III-91, III-95, III-99 and standard operating procedure used by GMUG silviculturists.
SP-4	To keep impacts to soils (sterilization) to a minimum pile size should be limited as follows. Piles at landings, where soils are impacted by previous yarding and loading, can be up to 20-30' in diameter, or 400-900 square feet. Piles in interior areas of treatment units, where soils are less disturbed, should be limited to 10-20' in diameter (100-400 square feet). Attempt to keep total area covered by piles/acre under ~5% (<2,500 square feet/acre covered by piles). Too many small piles (<10' diameter) results in inefficiency in burning them. Where landing piles are burned, the previously impacted soils should be rehabilitated by scarification following burning. When possible do not place green material exceeding 8" in burn piles. If practicable, design treatments so activity fuels larger than 8" are removed from the site. Build machine piles in such a manner that keeps them free of topsoil to facilitate more efficient burning and combustion. Piles should be spaced adequately away from leave trees to reduce damage to trees during burning.	Professional judgment and standard operating procedure used by GMUG silviculturists and fuels managers.
SP-5	In areas treated for recovery where beetle kill is prominent, piles will be burned as soon as burn conditions for pile burning occur (usually first adequate snowfall event). Where possible, piles should be located in proximity to roads that prescribed burn personnel can reach the site either by motorized vehicle (truck, UTV, ATV, or snowmobile) or by foot without having to hike or ski more than ¼ to ½ mile to reach the piles.	Professional judgment and standard operating procedure used by GMUG silviculturists and fuels managers.

SP-6	Activity-generated fuels would be reduced in compliance with the treatment Brush and Disposal (BD) plan. Fuels, silviculture and timber resources management personnel would develop prescriptions considering economical harvest methods, activity fuels and residual site conditions.	FSH 2409.19
SP-7	Slash piles should not be located within 2 tree lengths of the tallest residual snags or groups of snags in salvage treatments or within 2 tree lengths of the perimeters of salvage units. If possible this design feature should be applied to resiliency treatments as well, though due to smaller size and higher percentage of live canopy in resiliency treatments, it may be less applicable.	Safety requirement for firefighters burning slash piles during better dispersion (ie, windy) conditions.
SP-8	Monitor a sample of pile burn scars for bare soil and— on scars located on slopes and in swales—for the presence of rills, gullying, or soil movement. If >100 sq ft of burn scar consisting of bare soil; minor rilling or gullying present within or adjacent to burn scar; minor deposition of soil downslope of scar, treatment bare soil and erosion according to District protocols, which may include one or two of the following: addition of mulching, scarification, inoculation with adjacent soils, seeding, etc. If monitoring reveals >200 sq ft of burn scar consisting of bare soil; multiple rills, or gullying, or gullying 2-3" deep within burn scar; significant deposition of soil downslope of scar, elevate treatment application. (A decision-making trigger identified in Chapter 2).	Professional judgment; SBEADMR-specific monitoring component
Transportation System and Haul Routes Objectives: Manage travel management effectively to provide resource protection and a safe, environmentally sound, and efficient transportation system.		
TSHR-1	Existing roads will be used for equipment access to the extent road location and condition permit reasonable access. Implementation of mechanical treatments and harvests will attempt to minimize road construction whenever possible.	USDA Forest Service, 2006. Conservation Practices Handbook and treatment-specific design
TSHR-2	New Access Roads: Where terrain, road length, and other resource risks exist, a "Designed Road" shall be utilized for Treatment access. Designed Roads would be surveyed, designed, and administered by the Forest Service engineering department. Designed Roads may, in rare circumstances, become National Forest System roads if needed for long-term access and utilization, or they will be subsequently decommissioned if only needed for temporary treatment access. The District Ranger shall be responsible for determining whether a designed road is to be added to the Forest transportation system. Temporary roads may be used where a designed road is not needed, as determined by the Forest Service. The location and clearing widths of all Temporary Roads or facilities shall be agreed to in writing (between the Forest Service and the contractor) before construction is started. Following use for harvest and treatment implementation, temporary roads will be decommissioned, which involves re-contouring where significant side slope exists, elimination of ditches and other structures, out-sloping during construction, removal of ruts and berms, effectively blocking the road to normal vehicular traffic where feasible, and construction of drainage features such as cross ditches and water bars. Invasive species monitoring will occur after road decommissioning and will be followed by weed treatments where needed. Effectiveness of road closure will also be monitored.	Treatment- specific design Timber Sale Contract Standard Provisions (Contract FS-2400-6, USDA Forest Service 2006)
TSHR-3	Require commercial haulers to perform maintenance commensurate with their use; depositing sufficient funds with the Forest Service may be used in lieu of performance. Surface rock replacement deposits will be collected to maintain currently surfaced	FSM 7732.03

	roads that are used for timber hauling. Deposits will be collected commensurate with the use. Quarry materials will be collected from a site that has been found to be free of invasive plants.	
TSHR-4	Timber hauling operations will be restricted during wet or thawed conditions, when needed to protect the road surface.	USDA Forest Service, 2012. FS National BMPs; Treatment- specific design
TSHR-5	Safety signing will be used to alert the public that logging operations are in progress and would meet the requirements of the Manual of Uniform Traffic Control Devices (MUTCD).	Timber Sale Contract Standard Provisions (Contract FS-2400-6, USDA Forest Service 2006); FSM 7160
TSHR-6	Use of private roads, encroachment of public roads and rights-of-way, and other access needs outside Forest Service jurisdiction shall have the proper approval or authorization in place prior to use.	16 U.S.C. 572; treatment-specific design
TSHR-7	Use suitable road surface stabilization practices and dust abatement supplements on roads where road surface conditions, traffic use and proximity to recreation or public occupancy justify the need . (See FSH 7709.56 and FSH 7709.59).	USDA Forest Service, 2012.
TSHR-8	Move snow in a manner that will avoid or minimize disturbance of or damage to road surfaces and drainage structures. Use existing standard contract language (C5.316# or similar) for snow removal during winter logging operations to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources.	USDA Forest Service, 2012
TSHR-9	Use the following measures to conserve water when managing roads for SBEADMR: • Locate new roads with consideration of key topographic factors important to road maintenance, including steepness of slope, position on slope, aspect and drainage pattern. • When possible, schedule road maintenance activities to coincide with higher moisture content for ease of grading and better compaction. • Minimize new road widths to provide for safe use while limiting impermeable surfaces. • Keep ditches open, but do not remove vegetation that does not impede drainage. Vegetation holds the soil in place and reduces sediment loading which is the greater problem. • When installing drainage features, return intercepted runoff to its natural path at the first opportunity. • To avoid clogging, keep the grade of drainage features as steep or steeper than the roadway. In general, avoid stream crossings. Where necessary, align the roadway to fit the stream. Avoid road capture of the channel, which can result in the stream diverting down the road – causing severe erosion. Do not constrict and accelerate flows, which can erode the channel.	Zeedyk, W. Water Harvesting from Low-Standard Rural Roads. 2006.

Water Quality and Soil Productivity

Objectives:
1. Manage treatments to maintain ground cover to prevent harmful increases in runoff.
2. In the Water Influence Zone (WIZ) next to perennial & intermittent streams, lakes, and wetlands, allow only those actions that maintain or improve long-term stream health and riparian ecosystem condition
3. Design and construct all stream crossings and other in-stream structures to provide for passage of flow and sediment, withstand expected flood flows, and to allow free movement of resident aquatic life.
4. Maintain long-term ground cover, soil structure, water budgets, and flow patterns of wetlands to sustain their ecological functions.
5. Limit roads and other disturbed sites to the minimum feasible number, width, and total length.
6. Construct roads and other disturbed sites to minimize sediment discharge into streams, lakes, & wetlands.
7. Stabilize and maintain roads and other disturbed sites during and after construction to control erosion.
8. Reclaim roads, landings and other disturbed sites when use ends, as needed, to prevent resource damage.
9. Manage land treatments to limit the sum of severely burned soil and detrimentally compacted, eroded, and displaced soil to no more than 15% of any activity area.

The following design features to protect watershed resources are based on, and structured according to the Region 2 Watershed Conservation Practices Handbook. They address conditions or circumstances that have occurred on recent GMUG NF timber sales. Additional BMPs in the R2 Handbook or National Handbook may apply within future treatment areas as determined during treatment-specific assessments. The various measures may be achieved through avoidance, on-the-ground marking, appropriate contract provisions, identification on the sale or service area map, and/or during sale or contract administration.

Treatment-specific soils, hydrologic, and watershed condition assessments will be performed prior to any on-site work (see Appendix C). Treatment-specific design features will be selected based on treatment tasks and the results of treatment-specific assessments.

<table>
<tr><td>WQSP-1</td><td>A. Maintain the organic ground cover of each activity area so that pedestals, rills, and surface runoff from the activity area are not increased. The amount of organic ground cover needed will vary by different ecological types and should be commensurate with the potential of the site.
B. Restore the organic ground cover of degraded activity areas within the next plan period, using certified local native plants as practicable; avoid persistent or invasive exotic plants.</td><td>USDA Forest Service 2006</td></tr>
<tr><td>WQSP-2</td><td>A. The minimum horizontal width of the Water Influence Zone for various water related features is as follows:
<table><tr><th>Feature</th><th>Outside Edge of WIZ</th><th>No Harvest or Mechanical Travel Zone</th></tr><tr><td>Fens and their associated wetlands</td><td>100 ft minimum from edge of fen</td><td>100 ft from edge of fen</td></tr><tr><td>Perennial Streams</td><td>100 ft. from stream bank</td><td>50 ft from stream bank</td></tr><tr><td>Intermittent Streams, Reservoirs and Ponds</td><td>50 ft. from bank or high water line</td><td>25 ft from bank or high water line</td></tr><tr><td>Wetlands ≥ ¼ acre</td><td>100 ft. from edge of wetland</td><td>50 ft from edge of wetland</td></tr></table></td><td>USDA Forest Service 2006, Management Prescription 09A in 1991 Forest Plan, and treatment-specific design</td></tr>
</table>

	<table><tr><td>Springs/Seeps/Wetlands/ depression recharge areas < ¼ acre</td><td>50 ft. from the source or edge of associated wetland, whichever is greater</td><td>25 ft from the source of edge of associated wetland, whichever is greater</td></tr><tr><td>Ephemeral Streams and Swales</td><td>25 ft from the channel or topographic low</td><td></td></tr><tr><td>Ditch</td><td>Edge of Right of Way</td><td></td></tr></table> B. Keep heavy equipment out of streams, swales, and lakes, except to cross at designated points, build crossings, or do restoration work, or if protected by at least 1 foot of packed snow or 6 inches of frozen soil. Keep heavy equipment out of streams during fish spawning, incubation, and emergence periods. C. Ensure at least one-end log suspension in the WIZ. Fell trees in a way that protects vegetation in the WIZ from damage. Keep log landings and skid trails out of the WIZ, including swales. D. Locate new concentrated-use sites outside the WIZ if practicable and outside riparian areas and wetlands. Armor or reclaim existing sites in the WIZ to prevent detrimental soil and bank erosion. E. Do not excavate earth material from, or store excavated earth material in, any stream, swale, lake, wetland, or WIZ. F. Maintain at least 80 percent of potential ground cover within the WIZ G. Burn piles may be located within the outer half of WIZs but must not cover more than 15% of the ground. H. Avoid direct ignition of prescribed fire within WIZs. Prescribed fire may be allowed to back in to these areas.		
WQSP-3A	A. Install stream crossings to meet Corps of Engineers and State permits, pass normal flows, and be armored to withstand design flows. B. Size culverts and bridges to pass debris. Engineers work with hydrologists and aquatic biologists on site design. C. Install stream crossings to sustain bankfull dimensions of width, depth, and slope and keep streambeds and banks resilient. Favor bridges, bottomless arches or buried pipe-arches for those streams with identifiable flood plains and elevated road prisms, instead of pipe culverts. Favor armored fords for those streams where vehicle traffic is either seasonal or temporary, or the ford design maintains the channel pattern, profile and dimension.			USDA Forest Service 2006
WQSP-3B	Where access across the WIZ must be provided by temporary roads, they will be completely decommissioned by obliteration within 5-years of sale closure. Obliteration at crossings will include the removal of culverts & fill material, the re-contouring of stream banks to the original landform shape, and seeding & mulching of the disturbed surfaces. The remaining prism within the WIZ shall be de-compacted, seeded, and mulched.			Management Prescription 09A, 1991 Forest Plan, and treatment-specific design
WQSP-4	A. Keep ground vehicles out of wetlands. Do not disrupt water supply or drainage patterns into wetlands. B. Keep roads and trails out of wetlands. Avoid actions that may dewater or reduce water budgets in wetlands. C. Avoid any loss of rare wetlands such as fens and springs. D. Do not build fire lines in or around wetlands unless needed to protect life, property, or wetlands. Use hand lines with minimum feasible soil disturbance. Use wetland features as firelines if practicable.			USDA Forest Service 2006, Executive Order 11990, and treatment-specific design

WQSP-5A	Manage land treatments to limit the sum of severely burned soil and detrimentally compacted, eroded, and displaced soil to no more than 15% of any activity area.	USDA Forest Service 2006.
WQSP-5B	A. With the exception of general road grading, avoid soil-disturbing actions during periods of heavy rain or wet soils. Apply travel restrictions to protect soil and water. B. Install cross drains to disperse runoff into filter strips and minimize connected disturbed areas. Make cuts, fills, and road surfaces strongly resistant to erosion between each stream crossing and at least the nearest cross drain. Revegetate using certified local native plants as practicable; avoid persistent or invasive exotic plants. C. Use existing roads unless other options will produce less long-term sediment. Reconstruct for long-term soil and drainage stability. D. Avoid ground skidding on sustained slopes steeper than 40% and on moderate to severely burned sustained slopes greater than 30%. Conduct logging to disperse runoff as practicable. E. Locate and construct log landings in such a way to minimize the amount of excavation needed and to reduce the potential for soil erosion. Design landings to have proper drainage. After use, treat landings to disperse runoff and prevent surface erosion and encourage revegetation.	USDA Forest Service 2006 and treatment-specific design
WQSP-6	A. Design all roads, trails, and other soil disturbances to the minimum standard for their use and to "roll" with the terrain as feasible. B. Use filter strips, and sediment traps if needed, to keep all sand-sized sediment on the land and disconnect disturbed soil from streams, lakes, and wetlands. Disperse runoff into filter strips.	USDA Forest Service 2006 and treatment-specific design
WQSP-7A	A. Do not encroach fills or introduce soil into streams, swales, lakes, or wetlands. B. Space cross drains according to road grade and soil type as indicated below: (ex. 01). Do not divert water from one stream to another. C. Empty cross drains onto stable slopes that disperse runoff into filter strips. On soils that may gully, armor outlets to disperse runoff. Tighten cross-drain spacing so gullies are not created. D. Where berms must be used, construct and maintain them to protect the road surface, drainage features, and slope integrity while also providing user safety.	USDA Forest Service 2006 and treatment-specific design

WQSP-7B

A. Skid trail locations will be agreed to by the Forest Service in advance of construction; spacing will be approximately 100 feet apart, allowing for topographic variation and skid trail convergence. Space water bars as appropriate on skid trails according to slope and soil type as indicated below:

Unified Soil Classification - ASTM D 2487[1]				
Slope (%)	**ML, SM Extremely Erodible Silts &sands with little or no binder (i.e. decomposed granite)**	**MH, SC, CL Highly Erodible Silts & sands with moderate binder**	**SW, SP, GM, GC Moderately Erodible Gravels + fines & sands with little or no fines**	**GW, GP Slightly Erodible Gravels with little or no fines**
1-3	200	300	400	500
4-6	125	200	300	400
7-9	100	150	200	250
10-12	70	100	150	200
13-25	50	50	75	100
25+	30-50	30-50	60-75	80-100

[1] American Society for Testing Materials, standard classification of soil for engineering purposes.

B. Space cross drains and rolling dips as appropriate on temporary roads according to road grade and soil type as described in FSH 2509.25 table 13.3 – Exhibit 01, Maximum Cross-Drain Spacing in Feet Based on Soil Types.

Unified Soil Classification - ASTM D 2487[1]				
Slope (%)	**ML, SM Extremely Erodible Silts &sands with little or no binder (i.e. decomposed granite)**	**MH, SC, CL Highly Erodible Silts & sands with moderate binder**	**SW, SP, GM, GC Moderately Erodible Gravels + fines & sands with little or no fines**	**GW, GP Slightly Erodible Gravels with little or no fines**
1-3	600	1000	1000	1000
4-6	300	540	680	1000
7-9	200	360	450	670
10-12	150	270	340	510
13-25	120	220	270	410

[1] American Society for Testing Materials, standard classification of soil for engineering purposes.

USDA Forest Service 2006, ASTM D-2487, and treatment-specific design

WQSP-8A	A. Site-prepare, drain, de-compact, revegetate, and close landings, main skid trails, and temporary and intermittent use roads and other disturbed sites within 5 years of the end of the associated timber sale. Provide stable drainage that disperses runoff into filter strips and maintains stable fills. Do this work concurrently. Stockpile topsoil where practicable to be used in site restoration. Revegetate using certified local native plants as practicable; avoid persistent or invasive exotic plants. B. Remove all temporary stream crossings (including all fill material in the active channel), restore the channel geometry, and revegetate the channel banks using certified local native plants as practicable; avoid persistent or invasive exotic plants. C. Restore cuts and fills to the original slope contours where practicable and as opportunities arise to re-establish subsurface pathways. Use certified local native plants as practicable; avoid persistent or invasive exotic plants. Obtain storm water (402) discharge permits as required.	USDA Forest Service 2006 and treatment-specific design
WQSP-8B	In decommissioning roads, A. Implement suitable measures to close and physically block the road entrance so that unauthorized motorized vehicles cannot access the road. B. Establish effective ground cover (i.e. erosion control measures and revegetation) on disturbed sites to avoid or minimize accelerated erosion and soil loss. C. Evaluate risks to soil, water quality, and riparian resources and use the most practicable, cost-effective treatments to achieve long-term desired conditions and water quality management goals and objectives. D. Use applicable practices of BMP Fac-2 (Facility Construction and Storm water Control) for Storm water management and erosion control when obliterating designed roads. E. Implement suitable measures to re-establish stable slope contours and surface and subsurface hydrologic pathways where necessary to the extent practicable to avoid or minimize adverse effects to soil, water quality, and riparian resources. F. Remove drainage structures. G. Re-contour and stabilize cut slopes and fill material when needed.. H. Reshape the channel and streambanks at crossing sites to pass expected flows without scouring or ponding, minimize potential for undercutting or slumping of streambanks, and maintain continuation of channel dimensions and longitudinal profile through the crossing site. I. Restore or replace streambed materials to a particle size distribution suitable for the site. J. Restore floodplain function. K. Implement suitable measures to promote infiltration of runoff and intercepted flow and desired vegetation growth on the road prism and other compacted areas. L. Use suitable measures in compliance with local direction to prevent and control invasive species. Design features described in Part 3, National Core BMPs, of the National Best Management Practices for Water Quality Management on National Forest System Lands shall be used as needed.	USDA Forest Service 2012
WQSP-9A	A. Restrict roads, landings, skid trails, concentrated-use sites, and similar soil disturbances to designated sites. B. Operate heavy equipment for land treatments only when soil moisture is below the plastic limit, or protected by at least 1 foot of packed snow or 6 inches of frozen soil. C. Conduct prescribed fires to minimize the residence time on the soil while meeting the burn objectives. This is usually done when the soil and duff are moist.	USDA Forest Service 2006, FSH 2509.18, Soil Management Handbook, 1992, and treatment-specific design
WQSP-9B	Fire lines and fuel breaks should utilize existing roads, skid trails, natural features, and use of wet lines as much as possible to minimize impacts caused by new line construction.	*Treatment-specific design*
WQSP-9C	The total length and width of constructed lines should be minimized. Blading to expose bare mineral soil displaces the nutrient and organic matter enriched surface horizon and increases the risk of erosion and spread of noxious weeds.	*Treatment-specific design*

WQSP-9D	Avoid dozer line construction on slopes greater than 30%.	*Treatment-specific design*
WQSP-9E	After use, pull soil and litter back into the fire line, seed, and top scatter slash if available. Where fire lines create cut slopes re-contour by pulling side cast or fill material back, seed, and top scatter slash if available immediately after use.	*Treatment-specific design*
WQSP-9F	Avoid direct ignition of concentrated areas of dry masticated materials greater than 2" in depth. Prescribed fire may be allowed to burn into these areas.	*Treatment-specific design*
WQSP-10	To ensure the HUC12 disturbance is less than 25 percent, maintain disturbance acres from mechanical harvest and roads to less than 25 percent of the HUC14 area. (A decision-making trigger identified in Chapter 2).	Eaglin and Hubert 1993; USDA Forest Service 2006; and treatment-specific design

Wildlife, Fish and Rare Plants

Objectives:

1. Design treatments to meet applicable objectives and standards with the Southern Rockies Lynx Amendment (SRLA). Consider guidelines outlined in the SRLA in treatment planning. When guidelines cannot be met, provide rationale to Fish and Wildlife Service (FWS) in year-end reporting.
2. Design treatments to meet applicable Forest Plan standards and guidelines related to wildlife.
3. Complete annual reporting to FWS as required by the SRLA.
4. Seek opportunities to integrate wildlife habitat management objectives as part of treatment activities.
5. Design treatments to meet Gunnison sage-grouse habitat objectives from the Range-wide Plan.

WFRP-1	All applicable management Objectives, Standards and Guidelines contained in the Southern Rockies Lynx Amendment will be applied during treatment planning and implementation.	USDA Forest Service, Rocky Mountain Region, 2008. (SRLA)
WFRP-2	At a minimum, in spruce-fir forest types maintain 90 to 225 snags per 100 acres, 10 inches in diameter at breast height (dbh) or greater (where biologically feasible). In aspen forest types, maintain 120 – 180 snags per 100 acres, 8 inches dbh or greater (where biologically feasible). Snags would be maintained away from structures, roads and trails so that they do not create safety hazards to the public. Where possible, utilize natural sinuosity or drainages for linking groups. Protect standing wildlife trees from damage during site preparation and post-sale activities.	GMUG Forest Plan Standards and Guidelines
WFRP-3	Where feasible, maintain a minimum of 10-20 tons per acre of coarse woody debris within harvest units. Where possible in regeneration units, create piles of logs, stumps, or other woody debris to minimize the effects of larger openings.	GMUG Forest Plan Standards and Guidelines
WFRP-4	Maintain large diameter downed logs in various stages of decomposition within harvest units (50 linear feet/acre of 10 inches diameter or larger at the large end of lodgepole pine and aspen logs and/or 12 inches diameter or larger for Engelmann spruce, subalpine fir and Douglas fir logs).	GMUG Forest Plan Standards and Guidelines
WFRP-5	In forested areas where salvage, resiliency, combination, prescribed burn and mechanical treatments are implemented, strive to maintain forested cover on 60% or more of the perimeter of all natural and created openings, and along at least 60% of each NFS Road (level 5 and below) that has high levels of human use during the time deer and elk would be expected to inhabit an area. Roads with restricted use could provide for less cover. Except where natural openings or parks exist along roads and when applying hazard tree removal activities along roads to meet public safety goals, gaps along roads should not exceed ¼ mile. Cover should be well-distributed across the landscape. Minimum sizes for hiding and thermal cover patches are 2 -5 acres for mule deer, and 30 – 60 acres for elk. The intent is to maintain or improve habitat diversity and make or keep the area in a condition where deer and elk can effectively use the area by managing the vegetation and human activity. This design feature provides an opportunity to	Direction for maintaining habitat connectivity at the landscape scale, and to retain hiding and thermal cover for big game; GMUG Forest Plan (Page III-28, General Direction 01, Standard and Guideline a and b)

	implement the proposed commercial and noncommercial activities in a way that accomplishes these wildlife habitat objectives while also meeting the purpose and need of the project. District wildlife, timber and fire programs will coordinate closely during the planning and design phase of projects to accomplish these objectives.	
WFRP-6	Provide hiding cover within 1,000 feet of any known elk calving areas. The District wildlife biologist will be responsible for coordinating with Colorado Parks and Wildlife to identify calving areas and informing timber and fire staff on locations. When calving areas are identified, a 1,000 foot buffer will be applied and existing vegetation conditions within the buffer will be assessed by the District biologist to determine cover needs, identify areas to avoid with treatments, or coordinate with timber and fire staff to determine how treatments could be designed to maintain or enhance cover.	GMUG Forest Plan (Page III-24, General Direction 01, Standard and Guideline a)
WFRP-7	Northern goshawk - No activities will be allowed within ½ mile of active nests from March 1 to August 31. The timing restriction buffer could be reduced to ¼ mile if topographic features and/or adequate screening cover are present that would protect the nest site from disturbance. No harvest activities will be allowed within a 30-acre buffer of nest sites. Outside of a 30-acre area around goshawk nest sites, timing restrictions are not needed for treatment layout, marking, and any other activities that are non-disturbing (i.e., activities not involving the use of heavy equipment or chainsaws). Timing restrictions will only apply to active nests, as confirmed by the GMUG National Forests' wildlife biologist. The District wildlife biologist will keep the timber and fire staff informed on nest status and locations.	Colorado Parks and Wildlife Raptor Buffer and Timing Restriction Recommendations; GMUG Forest Plan Standards and Guidelines
WFRP-8	Northern goshawk – provide or leave 20% of pole or mature tree stands adjacent to nesting sites with at least 150 square feet of basal area. Provide or leave at least one class 1 log adjacent to nest sites. The District wildlife biologist will be responsible for coordinating with timber and fire staff on nest locations and assessing vegetation conditions adjacent to nest sites.	GMUG Forest Plan (Page III-24, General Direction 01, Standard and Guideline e)
WFRP-9	On-going surveys for raptors would be conducted to determine locations of individuals or populations of these species and allow for the implementation of protection measures using the appropriate buffer or timing restriction.	Treatment- specific design; Migratory Bird Treaty Act
WFRP-10	Retain live trees in salvage units, except for trees that need to be removed for operational/safety or silvicultural purposes. Operational/safety or silvicultural purposes include the need to remove live trees if necessary to access dead trees for salvage or to address safety concerns.	Treatment- Specific Design
WFRP-11	Skid trails and landings will be located to minimize impacts to advanced regeneration. Skid trails will be placed at least 100 feet apart, except where they converge at landings.	Treatment- Specific Design
WFRP-12	Areas supporting live advanced regeneration with >35% Dense Horizontal Cover in blocks greater than 0.3 acres will be avoided to the extent possible during layout [and during harvest operations], while allowing feasible operations..	SRLA – VEG S6 Standard
WFRP-13	Landings and main skid trails should be evaluated by a soil scientist/specialist to determine if detrimental soil compaction has occurred. Based on review by a specialist, when detrimental compaction is found, subsoil ripping may be applied to reduce soil impacts when a site prep contract is necessary for an area. When a site prep contract is necessary, this provides the opportunity to rip skid trails and landings in the area and potentially in nearby adjacent areas. This would provide for a more suitable seedbed for future regeneration, thus preventing permanent impacts of skid trails that when left in a compacted state, often do not regenerate as well as adjacent un-compacted areas. Importantly, all operations will conform to the direction in Chapter 10 of the Water Conservation Practices Handbook including managing treatments to limit the sum of severely burned soil and detrimentally compacted, eroded, and displaced soil to no more than 15% of any activity area.	Treatment- Specific Design to address impacts and recovery of snowshoe hare and lynx habitat (SRLA); Water Conservation Practices Handbook, FSH 2509.25, Chapter 10
WFRP - 14	Surveys for threatened, endangered, and sensitive (TES) species will occur prior to design of a treatment. However, since it may take several years to fully implement a treatment, some level of TES re-survey will occur on an annual basis. If TES species are confirmed present, applicable design features identified in this table will be applied to ensure consistency with the Forest Plan, Endangered Species Act, and Forest Service Sensitive Species Policy. Once a project is in the implementation phase, if TES species are confirmed present during operations the District wildlife biologist will be consulted and the appropriate standards for the Forest Plan will be applied (timing restrictions, buffer of nest sites, identify no cut area around nest sites, etc.). For example, if a new goshawk nest is found during operations, operations will stop; the District biologist will be informed and will evaluate the situation to determine if adverse impacts are occurring. This may include establishing an avoidance area around	Treatment- Specific Design; Endangered Species Act; Forest Service Sensitive Species Policy; Migratory Bird Treaty Act

	the occupied habitat or nest site consistent with Forest Plan direction and best available science to avoid impacts that could lead to nest abandonment and/or mortality.	
WFRP-15	Winter logging is encouraged to limit direct disturbance to the fewest number of wildlife species as possible. When possible, avoid treatment activities in areas where big game (elk, deer, pronghorn and moose) are known to occur. When big-game winter range is bisected by proposed haul routes and there are concentrations of animals along these routes minimize stress to wintering animals to the extent practicable by: A. Re-routing along another acceptable route. B. From December 1 to April 15, restrict haul times to between 9 am and 4 pm, unless otherwise agreed to in writing by the Forest Service. The district biologist will coordinate with Colorado Parks and Wildlife to asses big game use and identify areas where animals concentrate during winter, and assess if there is a need to implement conservation measures. This would be a coordinated effort with the GMUG, Colorado Parks and Wildlife, and the timber purchaser. When the need arises to protect concentrations of wintering big game, the District wildlife biologist will be responsible for providing the timber staff with maps of these areas.	GMUG Forest Plan General Direction 04, 05c. and 05f. (page III-76 – II-77)
WFRP-16	Gunnison sage-grouse – Portions of haul routes may occur in occupied habitat in few areas. Where use of haul routes have the potential to impact Gunnison sage-grouse as determined by the District wildlife biologist, timing restrictions should be applied that prohibit the use of haul routes that occur within 0.6 mi of active leks (breeding sites) from March 15 – May 15. Haul routes that are open to the public year-round would be excluded from this design feature (this applies to main roads such as State and U.S. highways and certain county roads). Noncommercial treatments at lower elevations have the potential to incidentally affect sagebrush habitat. Avoid areas of sagebrush habitat. The District wildlife biologist will be responsible for coordinating with Colorado Parks and Wildlife to verify annual lek status and in coordinating with timber and fire staff on locations of sage-grouse habitat avoidance areas.	Gunnison Sage-Grouse Range-wide Conservation Plan; Endangered Species Act; Nov. 20, 2014 final listing decision and critical habitat designation- FR79 No.224 Part II and Part III.
WFRP-17	Following basic conservation biology principles, habitat connectivity will be maintained at the landscape scale (Lynx Analysis Unit scale for lynx) through various methods depending on treatment type, location, site-specific conditions and overall condition of each Lynx Analysis Unit. Methods may include a combination of variable retention regeneration harvest methods through resiliency treatment types; tree retention areas of various sizes and shapes to retain snag groups and protect live understory trees across the landscape, with emphasis on multi-storied forest stands and areas typically used by wildlife as travel corridors (ridges, saddles, stream corridors); and maintaining areas of high quality snowshoe hare habitat as determined from dense horizontal cover field surveys using an established scientific protocol (cover board protocol) In terms of habitat connectivity considerations and to meet Southern Rockies Lynx Amendment direction, there will be a lot of focus on protecting areas with high quality dense horizontal cover in multi-storied stands. On a timber sale by timber sale basis, coordination will occur between the District wildlife biologist and the timber staff to determine the appropriate method for accomplishing habitat connectivity goals, including determining the appropriate size, shape, and location of tree retention areas.	Treatment- specific design intended to support consistency with SRLA direction for lynx habitat connectivity. Interagency Lynx Biology Team. 2013
WFRP - 18	To maintain the amount and distribution of lynx foraging habitat over time capable of supporting lynx at the LAU scale, manage so that no more than 30% of the lynx habitat in an LAU is in an early stand initiation structural stage or has been silviculturally treated to remove horizontal cover (i.e., does not provide winter snowshoe hare habitat). Emphasize sustaining snowshoe hare habitat in an LAU. If more than 30% of the lynx habitat in an LAU is in early stand initiation structural stage or has been silviculturally treated to remove horizontal cover (e.g., clear-cuts, seed tree harvest, pre-commercial thinning, or understory removal), no further increase as a result of vegetation management treatments should occur on federal lands. Acres affected by lynx analysis unit through 2015 are available in the treatment analysis file. As management occur in the affected LAU over the life of the treatment, acres affected will be tracked by the District wildlife biologist and Forest wildlife program lead to ensure consistency with this conservation measure.	SRLA; Interagency Lynx Biology Team. 2013

WFRP-19	American (Pine) Marten – Research has shown that martens avoid openings created from vegetation management activities that completely remove all trees (structural stand initiation stage) if the openings are larger than 300 feet in width. In areas identified as multi-storied spruce-fir, openings created should be less than 300 feet in width unless suitable marten habitat is maintained within cutting units through snag, advanced regeneration, and course woody debris retention as described in the above design features. Cutting units of this size will only occur when salvage prescription are applied and will be subject to WFRP-12. Exception: areas where public safety is a concern (road corridors, around structures, etc.). Commercial treatments will target dead trees larger than eight inches in diameter so some residual cover will remain within cutting units. Irregular-shaped harvest units are desirable.	GMUG Forest Plan (Page III-24, General Direction 01, Standard and Guideline b)
WFRP-20	Within secondary habitat for lynx (300 foot buffer from primary habitat) retain spruce and fir in aspen-spruce mix stands. Primary habitat is defined as having a dominance of spruce-fir cover type. Most of the secondary habitat includes either pure aspen or aspen-spruce mixed stands.	USDA Forest Service, 2008 - Southern Rockies Lynx Amendment.
WFRP-21	When planning non-commercial treatments in critical habitat for Gunnison sage grouse, avoid direct treatment to sagebrush. Any treatment in designated critical habitat will be planned in coordination with the District Biologist.	Gunnison Sage-grouse Range-wide Steering Committee. 2005.
WFRP- 22	When planning treatments in mature aspen, complete inventories for purple martin and avoid these areas if birds are detected. In Colorado, habitat preference seems very specific: edges of mature aspen stands, usually near a stream, spring of pond	Colorado Breeding Bird Atlas, 1998.
WFRP-23	In LAU with extensive mortality of mid-late and late seral spruce (Habitat Structural Stages 4A, 4B and 4C), retain these live stands to the greatest extent practicable during project planning.	SRLA
WFRP - 24	To minimize spread of Amphibian Chytrid Fungus, at least one member of the Aquatics Team will participate in the planning and implementation of project-level operations. See also IW-2 for equipment washing requirements.	Johnson & Speare, 2003; Johson *et al.*, 2003
WFRP - 25	In areas where Boreal Toad is known to exist the timing of ground based activities may be limited by the season. Boreal Toads forage up to 1.6 miles from breeding sites (pond) between July and late October. Ground based operations of commercial or non-commercial equipment will be limited in these areas to when there is at least 4 inches of frozen soil or over snow to extent practicable. Under current known toad distribution, WFRP-25 would only apply to the Cement Creek commercial PTA.	Bartlet et al. 2004
WFRP - 26	Where non-commercial fuel reduction treatments overlap the occurrence of Boreal Toad there will be no mechanical operations (i.e. mastication, etc.). In these areas pile burning will be used to reduce fuels while concurrently minimizing ground disturbance, the possibility of indirect toad mortality and reduction or loss of hibernaculum habitat. Under current known toad distribution, WFRP-26 would only apply to the Buzzard Creek non- commercial PTA.	Bartlet et al. 2004

APPENDIX D – Impacts Related To Design Features

This table summarizes impacts that are avoided or minimized with design features for all of the action alternatives.

Threatened, endangered, proposed, sensitive or MIS species	**Number**	**Design Feature**
Canada lynx (threatened) and snowshoe hare. Other sensitive species and MIS also benefit, including goshawk, boreal owl, olive-sided flycatcher, pygmy shrew, and American marten.	WFRP-1	All applicable management Objectives, Standards and Guidelines contained in the Southern Rockies Lynx Amendment will be applied during project planning, analysis and implementation. **Avoidance or minimizing impact mechanism:** Objectives, standards and guidelines in the SRLA are designed to provide habitat for lynx at multiple scales. Specifically the SRLA provided guidance on habitat threats to reproduction, foraging, and movement. Anthropogenic influences that are of greatest concern to lynx are climate change, vegetation management, wildland fire management, and habitat fragmentation. The SRLA explicitly addresses 3 out of the 4 influences and through maintenance of high quality habitat for lynx addresses potential influences of climate change.
	WFRP-12	Areas supporting live advanced regeneration will be avoided to the extent possible during unit layout. Focus should be placed on areas with >35% Dense Horizontal Cover in blocks greater than 0.3 acres. **Avoidance or minimizing impact mechanism:** The SRLA and other more recent scientific literature (see Interagency Lynx Biology Team, 2013) provide a primary conservation goal is to provide a mosaic that includes dense early-successional coniferous and mixed –coniferous stands, along with a component of mature multi-story coniferous stands to produce the desired snowshoe hare density within each LAU. Standard VEG S6 limits projects that reduce winter snowshoe hare habitat in multi-story mature or late successional conifer forests to specific situations: 1. Within 200 feet of dwellings, recreation sites, etc.; 2) for research studies; 3) for incidental removal during salvage harvest (removal due to skid trails and landings); 4) when un-even-aged management (single tree and group selection) practices are used.
	WFRP - 18	To maintain the amount and distribution of lynx foraging habitat over time, manage so that no more than 30% of the lynx habitat in an LAU is in early stand initiation structural stage (SISS) or has been silviculturally treated to remove cover (Standard VEG S1).. **Avoidance or minimizing impact mechanism:** Standard VEG S1 states that unless board scale assessments have been completed that substantiates different historical levels of stand initiation structural stage limit disturbance to each LAU to no more than 30 percent of the lynx habitat in a LAU in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat (trees above average snow depth). Emphasize sustaining snowshoe hare habitat in an LAU. If more than 30% of the lynx habitat in an LAU is in early stand initiation structural stage or has been silviculturally treated to remove horizontal cover (e.g., clear-cuts, seed tree harvest, pre-commercial thinning, or understory removal), no further increase as a result of vegetation management projects should occur on federal lands. Cumulative impacts include all roads (assessed at 100% impact to the understory) and past management activity affecting the understory (harvest, prescribed fire, thinning, etc.) going back 25 years. A 25% residual impact to the understory due to past vegetation management activities is assumed. As management occurs in the affected LAU over the life of the project, acres affected will be tracked to ensure consistency with this conservation measure.

Threatened, endangered, proposed, sensitive or MIS species	Number	Design Feature
	WFRP-17	Habitat connectivity will be maintained at the Lynx Analysis Unit (LAU) scale. Multiple harvest methods including resiliency and variable retention. Other methods including protection of advanced regeneration to the extent possible will also be employed. **Avoidance or minimizing impact mechanism:** The SRLA and other more recent scientific literature (see Interagency Lynx Biology Team, 2013) provide a primary conservation goal is to provide a mosaic that includes dense early-successional coniferous and mixed –coniferous stands, along with a component of mature multi-story coniferous stands to produce the desired snowshoe hare density within each LAU. Standard VEG S6 limits projects that reduce winter snowshoe hare habitat in multi-story mature or late successional conifer forests to specific situations. Management of vegetation toward Potential Natural Vegetation (PNV) is the primary mechanism used to ensure connectivity is maintained at the LAU scale. PNV accounts for site specific factors (soils, elevation, etc.) and natural disturbances to establish a range expected vegetative seral conditions (USDA Forest Service 2005). Treatment-level design features will also be employed to help maintain connectivity.
	WFRP-11	Skid trails and landings will be located to minimize impacts to advanced regeneration. Skid trails will be placed at least 100 feet apart, except where they need to tie in together at landings. **Avoidance or minimizing impact mechanism:** Maintaining regeneration in the understory creates habitat for hares and other wildlife requiring ground-level cover. Use of designated skid trails also reduces soil impacts to harvest units, keeping adverse soil impacts within the 15% threshold as required by the GMUG Forest Plan.
Big game and retention of hiding cover	WFRP-5	In forested areas where salvage, resiliency, combination, prescribed burn and mechanical treatments are implemented, strive to maintain forested cover on 60% or more of the perimeter of all natural and created openings, and along at least 60% of each NFS Road (level 5 and below) that has high levels of human use during the time deer and elk would be expected to inhabit an area. Roads with restricted use could provide for less cover. Except where natural openings or parks exist along roads and when applying hazard tree removal activities along roads to meet public safety goals, gaps along roads should not exceed ¼ mile. Cover should be well-distributed across the landscape. Minimum sizes for hiding and thermal cover patches are 2 -5 acres for mule deer, and 30 – 60 acres for elk. **Avoidance or minimizing impact mechanism:** The intent is to maintain or improve habitat diversity and make or keep the area in a condition where deer and elk can effectively use the area by managing the vegetation and human activity. This design feature provides an opportunity to implement the proposed commercial and noncommercial activities in a way that accomplishes these wildlife habitat objectives while also meeting the purpose and need of the project. District wildlife, timber and fire programs will coordinate closely during the planning and design phase of projects to accomplish these objectives.

Threatened, endangered, proposed, sensitive or MIS species	Number	Design Feature
	WFRP-6	Provide hiding cover within 1,000 feet of any known elk calving areas. The District wildlife biologist will be responsible for coordinating with Colorado Parks and Wildlife (CPW) to identify calving areas and informing timber and fire staff on locations. **Avoidance or minimizing impact mechanism:** When calving areas are identified, a 1,000 foot buffer will be applied and existing vegetation conditions within the buffer will be assessed by the District biologist to determine cover needs, identify areas to avoid with treatments, or coordinate with timber and fire staff to determine how treatments could be designed to maintain or enhance cover.
	WFRP-15	Winter logging is encouraged to limit direct disturbance to the fewest number of wildlife species as possible. When possible, avoid treatment activities in areas where big game (elk, pronghorn and moose) are known to occur. When big-game winter range is bisected by proposed haul routes and there are concentrations of animals along these routes minimize stress to wintering animals to the extent practicable by: A. Re-routing along another acceptable route. B. Restrict haul times between 9 am and 4 pm The District Biologist will coordinate with CPW to assess big game use and identify areas where animals concentrate during winter, and assess if there is a need to implement conservation measures. This would be a coordinated effort with GMUG, CPW and the timber purchaser. Consideration for a waiver if the specified route is regularly used by the public during the specified restriction period. **Avoidance or minimizing impact mechanism:** Winter logging during cold weather minimizes impacts to understory vegetation and soils. Disturbance to wintering big game resulting from log hauling is anticipated to be minimal but could occur. Winter is often one of the most stressful times for wildlife due to limited food availability and exposure. Big game easily become stressed during sever winters. Minimizing disturbance can help increase survival rate and reduce probability of aborted fetuses.
Gunnison sage-grouse (threatened)	WFRP-16	Gunnison sage-grouse – Portions of haul routes may occur in occupied habitat in few areas. Where use of haul routes have the potential to impact Gunnison sage-grouse as determined by the effects analysis, timing restrictions should be applied that prohibit the use of haul routes that occur within 0.6 mi of active leks (breeding sites) from March 15 – May 15. **Avoidance or minimizing impact mechanism:** Vehicle use of a route within 0.6 miles of a lek has been found to disturb sage grouse when they are on the lek. This is especially true when vehicles ae traveling at a high rate of speed and during early morning in late afternoon. Specific haul routes that could be used for hauling have been identified and the restriction applied from March 15- May 15. Currently in the Gunnison Basin, many of these routes already have timing restrictions for sage grouse.

Threatened, endangered, proposed, sensitive or MIS species	Number	Design Feature
	WFRP-17	When planning non-commercial treatments in critical habitat for Gunnison sage grouse, avoid direct treatment to sagebrush. When treatments could affect critical habitat coordinate but are not dominated by sagebrush, coordinate with local experts to determine if current vegetation conditions are limiting sage-grouse productivity and design projects accordingly. **Avoidance or minimizing impact mechanism:** Because of the sensitivity of managing sage-brush to accomplish site-specific objectives avoidance is the primary mechanism to minimize effects to Gunnison sage-grouse. Management of sagebrush habitat will be completed under separate NEPA and consultation with Fish and Wildlife Service.
Cavity nesters, small mammals, raptors.	WFRP-2	At a minimum, in spruce-fir forest types maintain 90 to 225 snags per 100 acres, 10 inches in diameter at breast height (dbh) or greater (where biologically feasible). In aspen forest types, maintain 120 – 180 snags per 100 acres, 8 inches dbh or greater (where biologically feasible). Snags would be maintained away from structures, roads and trails so that they do not create safety hazards to the public. Trees to retain include large live trees with broken or dead tops (snag replacement trees), and other trees showing wildlife signs (dens, nests, cavities, squirrel middens, woodpecker activity) within and adjacent to harvest units to provide for perching, foraging, roosting, and nesting sites for wildlife. To compensate for the lack of snags along road corridors due to removal for OSHA safety needs, leave a greater density of wildlife trees in areas away from roads and landings. Snags within 500 feet of water (creeks, ponds, wet meadows, seeps, and springs), meadows/parks/forest openings, and ridge tops are particularly valuable to wildlife. Where possible, groups of snags in close proximity to each other or associated with green trees will be retained. Retention of snag groups will reduce wind-throw. Where possible, utilize natural sinuosity or drainages for linking groups. Leave snags with a variety of heights, shapes, and decay condition. Generally, taller and larger diameter snags provide better habitat for more species. Leave snags of all species type. Protect standing wildlife trees from damage during site preparation and post-sale activities. Focus on retention of snags in areas that support DHC >35%. **Avoidance or minimizing impact mechanism:** retention of snags and down wood will provide habitat for cavity nesters, small mammals and raptors within harvest units and within the matrix areas. Snags groups will be centered on areas supporting advanced regeneration to the greatest extent possible and be large enough to avoid wind throw. The goal is to create a mosaic that includes dense-early successional areas along with a component of live and dead mature trees across a treatment area.

Threatened, endangered, proposed, sensitive or MIS species	Number	Design Feature
Lynx, marten, and other species	WFRP-3	Maintain 10-20 tons per acre of coarse woody debris within harvest units to maintain soil moisture at ground level for mosses, fungi, and lichens and to encourage faster re-colonization of harvest units by small mammals and other prey species. Retain some small slash piles to provide habitat for small mammals. Where possible in regeneration units, create piles of logs, stumps, or other woody debris to minimize the effects of larger openings and to provide connectivity to adjacent stands for lynx, marten, and other species that may generally avoid open areas and utilize concentrations of down wood for foraging or denning. **Avoidance or minimizing impact mechanism:** Large wood on the forest floor is extremely important for soil nutrient re-cycling, shelter to encourage tree regeneration and habitat for variety of small mammals including hares and marten.
	WFRP-4	Maintain large diameter downed logs in various stages of decomposition within harvest units (50 linear feet/acre of 10 inches diameter or larger at the large end of lodgepole pine and aspen logs and/or 12 inches diameter or larger for Engelmann spruce, subalpine fir and Douglas fir logs). Utilize lop and scatter to the greatest extent practicable. **Avoidance or minimizing impact mechanism:** Large wood on the forest floor is extremely important for soil nutrient re-cycling, shelter to encourage tree regeneration and habitat for variety of small mammals including hares and marten.
Northern Goshawk (other sensitive and Management Indicator Species)	WFRP-7	Northern goshawk - No activities will be allowed within ½ mile of active nests from March 1 to August 31 or until fledging has occurred. The timing restriction buffer could be reduced to ¼ mile if topographic features and/or adequate screening cover are present that would protect the nest site from disturbance. No harvest activities will be allowed within a 30-acre buffer of nest sites. Outside of a 30-acre area around goshawk nest sites, timing restrictions are not needed for project layout, marking, and any other activities that are non-disturbing (i.e., activities not involving the use of heavy equipment or chainsaws). Timing restrictions will only apply to active nests, as confirmed by the USFS wildlife biologist. **Avoidance or minimizing impact mechanism**: Retention of a ½ mile buffer during the nesting and post-fledging period provides protection of the post-fledging area (PFA) during the period when goshawks fledge until the time that they leave the nest and are no longer dependent on the parents. Other design features (WFRP-2, 3, 4 and15) complement this design feature by providing for retention of snags, pockets of dense understory and large wood which provide habitat for prey species.
	WFRP-8	Northern goshawk – provide or leave 20% of pole or mature tree stands adjacent to nesting sites with at least 150 square feet of basal area. Provide or leave at least one class 1 log adjacent to nest sites. The District wildlife biologist will be responsible for coordinating with timber and fire staff on nest locations and assessing vegetation conditions adjacent to nest sites. **Avoidance or minimizing impact mechanism**: Helps maintain habitat within PFA.

Threatened, endangered, proposed, sensitive or MIS species	Number	Design Feature
Other raptors potentially occurring on the GMUG.	WFRP-9	On-going surveys for raptors would be conducted to determine locations of individuals or populations of these species and allow for the implementation of protection measures using the appropriate buffer or timing restriction, as determined by Colorado Parks and Wildlife raptor guidelines. **Avoidance or minimizing impact mechanism:** Under the Migratory Bird Act, management actions are to be designed to minimize effects to migratory birds. Many of the raptors the frequent the project area could be affected so use of buffer or timing restrictions as appropriate will avoid or minimize these effects.
Lynx, MIS and various sensitive species	WFRP-10	Retain all live trees in salvage units, except for trees that need to be removed for operational/safety or silvicultural purposes. Operational/safety or silvicultural purposes include the need to remove live trees if necessary to access dead trees for salvage or to address safety concerns. Clump live trees as much as possible to prevent wind throw. **Avoidance or minimizing impact mechanism**: In areas with extensive morality, retention of live trees creates a mosaic of patches of live and dead trees throughout the treatment. The use of a partial retention silvicultural prescription where the understory is retained (generally trees under 8 inches dbh and all tree species) maintains multiple age classes in the stand (shrub-seedlings and saplings-pole habitat structural stages). These habitat conditions provide habitat goshawk, American Marten, and hares as well as various small mammals.
	WFRP-23	In LAU with extensive mortality of mid-late and late seral spruce (Habitat Structural Stages 4A, 4B and 4C), retain these live stands to the greatest extent practicable during project planning. **Avoidance or minimizing impact mechanism:** Retention of live stands of habitat structural stages 4A, 4B and 4C spruce is an important conservation measure for any species that requires this habitat in a landscape with extensive mortality. These stands provide old-growth and multi-story characteristics important to lynx and their prey.
Canada lynx, snowshoe hares, minimize soil impacts	WFRP-9	Skid trails and landings will be located to minimize impacts to advanced regeneration. Skid trails should be placed at least 100 feet apart, except where they need to tie in together at landings. **Avoidance or minimizing impact mechanism:** See WFRP-12 above.
	WFRP-20	Within secondary habitat for lynx (300 foot buffer from primary habitat) retain spruce and fir in aspen-spruce mix stands. Primary habitat is defined as having a dominance of spruce-fir cover type. Most of the secondary habitat includes either pure aspen or aspen-spruce mixed stands. **Avoidance or minimizing impact mechanism**: While hares and lynx prefer multi-story spruce-fir stands, aspen with an understory of spruce does provide habitat value. This is especially true when aspen-spruce stands are adjacent to primary (core) lynx habitat. In secondary habitat allowing these mixed stands to succeed to stands dominated by spruce are a benefit to hares and lynx.

Threatened, endangered, proposed, sensitive or MIS species	Number	Design Feature
	WFRP-13	Landings and main skid trails will be evaluated by a soil scientist/specialist to determine if detrimental soil compaction has occurred. Based on review by a specialist, when detrimental compaction is found, subsoil ripping may be applied to reduce soil impacts when a site prep contract is necessary for an area. When a site prep contract is necessary, this provides the opportunity to rip skid trails and landings in the area and potentially in nearby adjacent areas. This would provide for a more suitable seedbed for future regeneration, thus preventing permanent impacts of skid trails that when left in a compacted state, often do not regenerate as well as adjacent un-compacted areas. Importantly, all operations will conform to the direction in Chapter 10 of the Water Conservation Practices Handbook including managing treatments to limit the sum of severely burned soil and detrimentally compacted, eroded, and displaced soil to no more than 15% of any activity area. **Avoidance or minimizing impact mechanism:** Logging activities can result in compaction of soils which will inhibit vegetation growth. When soil compaction is adverse, subsoiling will all grasses, forbs and trees to become reestablished. Recovery of vegetation provides long-term productivity for a variety of wildlife species.
TES policy requirements and assurance with Forest Plan requirements.	WFRP - 14	Surveys for threatened, endangered, and sensitive (TES) species will occur prior to design of a project. However, since it may take several years to fully implement a project, some level of TES re-survey will occur on an annual basis. If TES species are confirmed present the appropriate standards from the Forest Plan apply. Results of surveys for threatened, endangered, and sensitive species will be incorporated into project design and/or implementation. **Avoidance or minimizing impact mechanism:** Under Forest Service policy TES surveys are required to determine habitat use by these species in a treatment area. Data from these surveys are used to plan and implement a specified treatment.
Purple Marten	WFRP-22	When planning treatments in mature aspen, complete inventories for purple martin and avoid these areas if birds are detected. **Avoidance or minimizing impact mechanism**: In Colorado, habitat preference seems very specific: edges of mature aspen stands, usually near a stream, spring of pond. Retention of mature aspen in these areas helps conserve the species due to relative rareness on the GMUG.
Boreal toad	WFRP-24	To minimize spread of Amphibian Chytrid Fungus, at least one member of the Aquatics Team will participate in the planning and implementation of project-level operations. Design feature IW-2 requires equipment washing that will further reduce possible spread of Chytrid. **Avoidance or minimizing impact mechanism:** The use of heavy equipment in and around water can transfer spores from one area to another. Involvement of the aquatics team to assist in planning of projects will minimize this risk.

Threatened, endangered, proposed, sensitive or MIS species	Number	Design Feature
	WFRP-25	In areas where Boreal Toad is known to exist the timing of ground based activities may be limited by the season were possible. Boreal Toads forage up to 1.6 miles from breeding sites between July and late October to over winter. Ground based operations of commercial or non-commercial equipment will be limited to when there is at least 4 inches of frozen soil or over snow. **Avoidance or minimizing impact mechanism:** Toads migrate into forested areas in late summer an early fall to forage and winter in forested stands. Heavy equipment use in these stands during this time period could crush toads. Use of heavy equipment during winter when the ground is frozen or over snow also reduces risk to hibernating toads during winter. Only 2 watersheds (Buzzard and Cement Creek) with PTA are currently known to support toads.
	WFRP-26	Where non-commercial fuel reduction treatments overlap the occurrence of Boreal Toad there will be no mechanical operations (i.e. mastication, etc.). In these areas pile burning will be used to reduce fuels while concurrently minimizing ground disturbance and the possibility of indirect toad mortality and reduction or loss of hibernaculum habitat. **Avoidance or minimizing impact mechanism:** Boreal toads forage up to 1.6 miles from breeding sites between July and late October, and winter in small mammal burrows. Minimizing ground disturbance and mechanical operations in these areas reduces the risk to foraging/dispersing toads and prevents loss of hibernaculum habitat.

Appendix E – Cumulative Impacts by Watershed and Geographic Area

Note: In order to accurately portray cumulative impacts in analyzed watersheds, analyzed watersheds that spanned two GAs are merged into one GA as noted here: Agate added to Gunnison North and deleted from previous GA; Big Blue Creek-Blue Creek acres moved to Gunnison South; Headwaters Blue added to Gunnison South from San Juans; Ruby Anthracite and Barret Creek-Tomichi added to Gunnison South from Gunnison North; Owens Creek-Tomichi Creek and Porphyry Creek-Tomichi Creek added to Gunnison North from Gunnison South; Headwaters Buzzard from North Fork to Grand Mesa; Coal Creek from North Fork to Gunnison North; Specie Cr-San Miguel from Uncompahgre to San Juans; Headwaters Naturita from Uncompahgre to San Juans.

Note: Care has been taken to ensure these acres are mutually exclusive; they are not overlapping/double-counted.

						Baseline Disturbance			SBEADMR Maximum Proposed Additional Disturbance				Future Disturbance	Cumulative Disturbance		
	GA & HUC number	Subwatershed Name	Total Acres in Subwatershed	FS acres in Subwatershed	% FS ownership	Infrastructure Disturbance Total	Past Vegetation Treatments (Assumed 25% residual impact)	Baseline Total	PTAs & Hazard Trees (Assumed 25% impact)	New Roads, no past disturbance	Additional disturbance from new roads, past veg Tx	Additional impact total	Other Reasonably Foreseeable Disturbances (NFS lands)	% of FS lands in the watershed impacted by Past, Proposed, and Future Actions	≥20% cumulative disturbance?	Noted: Reservoir Disturbance Total
Grand Mesa Total						**2,419**	**6,403**	**8,822**	**8,114**	**16**	**1**	**8,131**	**253**			
Grand Mesa	140100051101	Owens Creek	10,334	10,030	97%	99	223	321	90		0	90		**4%**		
Grand Mesa	140100051102	Headwaters Buzzard Creek	21,479	21,475	100%	138	89	228	537		0	537		**4%**		
Grand Mesa	140100051103	Hightower Creek-Buzzard Creek	17,936	16,673	93%	155	730	885	1,144		0	1,144	**15**	**12%**		
Grand Mesa	140100051201	Leon Creek	28,684	27,640	96%	119	86	205	131		0	131	**5**	**1%**		

Grand Mesa	140100 051301	Grove Creek	16,563	5,358	32%	33	113	146	196	1	0	197		6%		
Grand Mesa	140100 051302	Big Creek	20,351	15,172	75%	243	726	969	531	4	1	536		10%		39
Grand Mesa	140100 051304	Cottonwood Creek	14,301	11,024	77%	107	118	225	489	3	0	492	37	7%		0
Grand Mesa	140100 051305	Bull Creek	14,626	8,914	61%	30	5	34	353	4	0	357	25	5%		313
Grand Mesa	140100 051307	Coon Creek	11,362	3,949	35%	24	33	57	229	0	0	229		7%		
Grand Mesa	140100 051308	Mesa Creek	21,663	7,814	36%	135	135	270	1,268	1	0	1,269		20%	Yes	250
Grand Mesa	140200 050106	Kiser Creek	21,784	8,806	40%	342	241	583	557	1	0	557	38	13%		
Grand Mesa	140200 050107	Dirty George Creek	20,206	9,639	48%	57	32	89	902		0	902		10%		1,204
Grand Mesa	140200 050108	Ward Creek	14,793	9,018	61%	115	135	250	31	0	0	31	96	4%		333
Grand Mesa	140200 050109	Oak Creek	14,297	4,871	34%	36	306	343	407		0	407		15%		483
Grand Mesa	140200 050111	Surface Creek	29,311	19,519	67%	172	118	290	765	0	0	765	37	6%		17
Grand Mesa	140200 050702	Headwaters Kannah Creek	38,139	37,527	98%	176	1,467	1,643	453	2	0	456		6%		
Grand Mesa	140200 050706	Whitewater Creek	30,688	3,627	12%	34	99	133	24		0	24		4%		
Gunnison Basin North Total						**7,287**	**13,572**	**20,859**	**12,917**	**39**	**7**	**12,964**	**5,971**			
Gunnison Basin North	140200 010101	Upper Taylor River	39,869	39,225	98%	211	31	242	45		0	45		1%		
Gunnison Basin North	140200 010102	Trail Creek-Upper Taylor River	18,447	18,169	98%	197	373	570	21		0	21	35	3%		
Gunnison Basin North	140200 010104	Texas Creek	25,922	25,839	100%	111	25	135	13		0	13		1%		
Gunnison Basin North	140200 010105	Headwaters Willow Creek	16,100	14,101	88%	113	83	197	8		0	8		1%		
Gunnison Basin North	140200 010106	Outlet Willow Creek	24,521	23,612	96%	282	280	562	21		0	21	2	2%		
Gunnison Basin North	140200 010108	Lottis Creek	26,954	25,883	96%	118	34	152	13		0	13		1%		
Gunnison Basin North	140200 010110	Rocky Brook-Spring Creek	20,890	20,850	100%	261	389	651	553	1	0	555	365	8%		
Gunnison Basin North	140200 010111	Bear Creek-Spring Creek	23,119	22,566	98%	168	196	364	226	3	0	229	1,320	8%		
Gunnison Basin North	140200 010112	Beaver Creek	18,310	16,121	88%	80	937	1,017	1,740		0	1,740	554	21%	Yes	
Gunnison Basin North	140200 010113	Lower Taylor River	39,290	35,324	90%	1,692	2,131	3,823	425		0	425	1,551	16%		
Gunnison Basin North	140200 010201	Upper East River	17,207	16,674	97%	76	0	76	5		0	5		0%		
Gunnison Basin North	140200 010202	Brush Creek	24,476	24,299	99%	76	0	76	59		0	59	1	1%		
Gunnison Basin North	140200 010203	Middle East River	16,676	13,768	83%	75	128	204	161	6	2	169	102	3%		
Gunnison Basin North	140200 010204	Coal Creek	13,147	10,083	77%	100	55	155	357	10	1	367		5%		
Gunnison Basin North	140200 010205	Oh-be-Joyful Creek-Slate River	21,472	16,447	77%	69	0	69	11		0	11		0%		

Gunnison Basin North	140200 010206	Washington Gulch-Slate River	22,977	10,782	47%	41	27	68	106	6	0	112		2%		
Gunnison Basin North	140200 010207	Cement Creek	22,850	21,710	95%	133	53	187	47	5	0	52		1%		
Gunnison Basin North	140200 010210	Lower East River	27,747	13,745	50%	89	64	153	11		0	11		1%		
Gunnison Basin North	140200 020101	Upper Ohio Creek	15,506	12,755	82%	41	38	79	105	1	0	106		1%		
Gunnison Basin North	140200 020103	Carbon Creek	16,053	10,288	64%	45	0	45	260	2	0	262		3%		
Gunnison Basin North	140200 020104	Mill Creek	10,667	8,056	76%	18	102	121	21		0	21	44	2%		
Gunnison Basin North	140200 020105	Middle Ohio Creek	19,522	7,130	37%	28	0	28	45	0	0	45		1%		
Gunnison Basin North	140200 020107	Sheep Gulch-Gunnison River	26,255	9,412	36%	182	662	845	1,067		0	1,067	112	22%	Yes	
Gunnison Basin North	140200 020201	Antelope Creek	21,030	4,529	22%	84	283	367	76	2	2	80	280	16%		
Gunnison Basin North	140200 020401	Beaver Creek	23,115	17,332	75%	14	18	32	13	0	0	14		0%		
Gunnison Basin North	140200 020402	Steuben Creek	16,499	12,804	78%	59	35	94	61		0	61	561	6%		
Gunnison Basin North	140200 020403	Willow Creek-Blue Mesa Reservoir	42,361	7,702	18%	123	215	338	939		0	939	160	19%		
Gunnison Basin North	140200 020701	East Elk Creek	14,154	10,197	72%	141	654	796	55		0	55	9	8%		
Gunnison Basin North	140200 020702	Red Creek	9,094	5,055	56%	61	391	452	138		0	138	15	12%		
Gunnison Basin North	140200 020705	Cow Creek-Soap Creek	24,267	23,207	96%	152	1,379	1,531	14		0	14	457	9%		
Gunnison Basin North	140200 021003	Corral Creek-Gunnison River	13,400	3,578	27%	52	430	483	17		0	17	173	19%		
Gunnison Basin North	140200 030101	Headwaters Tomichi Creek	17,989	16,352	91%	165	134	300	50		0	50		2%		
Gunnison Basin North	140200 030102	Agate Creek Total*	15,139	14,880	98%	102	20	122	489		0	489		4%		
Gunnison Basin North	140200 030105	Porphyry Creek-Tomichi Creek	25,105	20,217	81%	176	665	841	348		0	348		6%		
Gunnison Basin North	140200 030301	Upper Quartz Creek	25,889	23,477	91%	339	202	541	343	3	2	348		4%		
Gunnison Basin North	140200 030302	Gold Creek	19,356	16,056	83%	96	55	150	456	0	0	456	3	4%		
Gunnison Basin North	140200 030303	Middle Quartz Creek	17,870	13,131	73%	173	92	266	1,030		0	1,030	128	11%		
Gunnison Basin North	140200 030304	Alder Creek	10,991	7,932	72%	42	366	408	39		0	39	4	6%		
Gunnison Basin North	140200 030401	Owens Creek-Tomichi Creek	23,263	20,866	90%	151	1,081	1,232	748		0	748		9%		
Gunnison Basin North	140200 030404	Hot Springs Creek	28,903	17,061	59%	387	734	1,121	1,865		0	1,865		18%		
Gunnison Basin North	140200 030405	Wood Gulch-Tomichi Creek	22,880	2,175	10%	35	1	36	513		0	513		25%	Yes	
Gunnison Basin North	140200 030601	Sewell Gulch-Tomichi Creek	15,164	1,896	13%	20	134	154	73		0	73	15	13%		
Gunnison Basin North	140200 030602	Cabin Creek	10,107	2,996	30%	48	233	281	306		0	306	80	22%	Yes	
Gunnison Basin South Total						4,234	9,697	13,931	8,477	31	13	8,520	2,504			

Gunnison Basin South	140200020202	Headwaters South Beaver Creek	21,434	16,515	77%	46	0	46	7		0	7	**103**	**1%**		
Gunnison Basin South	140200020501	Mill Creek-Brush Creek	19,123	17,834	93%	76	161	237	117	0	0	117		**2%**		
Gunnison Basin South	140200020502	Headwaters Cebolla Creek	19,310	18,025	93%	210	283	493	539	2	0	541	61	**6%**		
Gunnison Basin South	140200020504	Spring Creek	23,225	20,390	88%	80	334	415	206	1	0	207		**3%**		
Gunnison Basin South	140200020506	Rock Creek	26,268	5,946	23%	42	0	42	249	3	0	252		**5%**		
Gunnison Basin South	140200020603	North Fork Henson Creek-Henson Creek	22,714	6,249	28%	17	0	17	11		0	11		**0%**		
Gunnison Basin South	140200020604	Nellie Creek-Henson Creek	30,782	11,589	38%	16	0	16	27		0	27		**0%**		
Gunnison Basin South	140200020606	Elk Creek-Lake Fork	35,597	19,316	54%	23	83	105	235		0	235		**2%**		
Gunnison Basin South	140200020607	Trout Creek-Lake Fork	24,597	5,640	23%	33	290	323	585		0	585		**16%**		
Gunnison Basin South	140200020610	Willow Creek	14,784	1,940	13%	23	178	201	129	4	1	135		**17%**		9
Gunnison Basin South	140200020801	Headwaters Blue Creek	26,873	26,873	100%	63	75	138	570		2	572		**3%**		
Gunnison Basin South	140200020802	Little Blue Creek	22,327	2,479	11%	41	308	350	119	0	2	122		**19%**		
Gunnison Basin South	140200021001	Pine Creek	373	112	30%	3	0	3	11	0	0	11		**13%**		
Gunnison Basin South	140200030103	Marshall Creek	36,742	33,603	91%	533	1,745	2,278	1,258	1	4	1,263	200	**11%**		
Gunnison Basin South	140200030104	Long Branch Creek	15,504	15,277	99%	37	204	241	32		0	32		**2%**		
Gunnison Basin South	140200030201	Headwaters Razor Creek	24,686	22,161	90%	134	230	364	219		0	219	90	**3%**		
Gunnison Basin South	140200030202	Outlet Razor Creek	18,852	3,892	21%	58	0	58	11		0	11		**2%**		
Gunnison Basin South	140200030402	Needle Creek	11,491	10,217	89%	43	453	496	7		0	7		**5%**		
Gunnison Basin South	140200030403	Barret Creek-Tomichi Creek	32,600	12,339	38%	122	137	259	20		0	20	**111**	**3%**		
Gunnison Basin South	140200030501	Headwaters Cochetopa Creek	31,713	30,748	97%	62	9	71	114		0	114		**1%**		
Gunnison Basin South	140200030502	Pauline Creek	26,481	24,904	94%	374	1,571	1,945	1,451	4	1	1,456		**14%**		
Gunnison Basin South	140200030503	Archuleta Creek	37,552	24,534	65%	970	279	1,249	187	2	2	191	223	**7%**		
Gunnison Basin South	140200030504	Headwaters Los Pinos Creek	32,085	31,698	99%	342	1,003	1,346	1,340	7	0	1,347	**302**	**9%**		
Gunnison Basin South	140200030505	Trail Creek-Cochetopa Creek	24,046	11,055	46%	41	422	464	264		0	264	**544**	**12%**		
Gunnison Basin South	140200030506	140200030506	9,912	1,653	17%	15	0	15	298		0	298		**19%**		
Gunnison Basin South	140200030507	West Pass Creek	31,859	27,363	86%	530	1,265	1,795	331	1	1	334	549	**10%**		32
Gunnison Basin South	140200030508	Rock Creek-Cochetopa Creek	23,762	7,497	32%	54	0	54	20		0	20	**321**	**5%**		
Gunnison Basin South	140200040301	Ruby Anthracite Creek	32,680	29,587	91%	80	5	85	128	5	0	133		**1%**		

North Fork Valley Total						**2,323**	**3,122**	**5,445**	**5,143**	**24**	**0**	**5,167**	**471**			
North Fork Valley	140200 021002	Curecanti Creek	25,226	20,614	82%	55	14	69	59	0	0	60	**372**	**2%**		
North Fork Valley	140200 021004	Crystal Creek	36,987	28,472	77%	154	342	495	295	4	0	299		**3%**		
North Fork Valley	140200 021005	Mesa Creek-Gunnison River	31,772	12,868	41%	324	188	512	164	3	0	167		**5%**		**228**
North Fork Valley	140200 021202	Muddy Creek	15,256	3,452	23%	28	0	28	13		0	13		**1%**		
North Fork Valley	140200 021204	Crawford Reservoir	10,303	1,020	10%	15	6	21	90		0	90		**11%**		
North Fork Valley	140200 021205	Middle Smith Fork	21,586	13,669	63%	36	369	405	25	1	0	26		**3%**		
North Fork Valley	140200 040101	Cow Creek	11,435	11,153	98%	60	41	101	272	3	0	275		**3%**		
North Fork Valley	140200 040102	Headwaters West Muddy Creek	20,251	18,802	93%	131	69	200	601	2	0	604		**4%**		
North Fork Valley	140200 040103	Outlet West Muddy Creek	31,024	21,568	70%	134	4	138	110		0	110	44	**1%**		
North Fork Valley	140200 040201	Little Muddy Creek	10,364	9,347	90%	90	0	90	32		0	32		**1%**		
North Fork Valley	140200 040204	Little Henderson Creek-East Muddy Creek	37,632	21,048	56%	90	83	173	291	1	0	292	10	**2%**		
North Fork Valley	140200 040404	Headwaters Hubbard Creek	13,194	12,717	96%	96	143	239	387	3	0	390		**5%**		
North Fork Valley	140200 040405	Outlet Hubbard Creek	23,895	13,639	57%	138	162	300	1,218		0	1,218		**11%**		
North Fork Valley	140200 040406	Terror Creek	18,829	13,976	74%	261	410	671	1,290	2	0	1,292	45	**14%**		
North Fork Valley	140200 040203	Lee Creek	13,813	11,474	83%	22	0	22	5		0	5		**0%**		
North Fork Valley	140200 040306	Outlet Clear Creek	12,908	12,695	98%	48	11	59	33		0	33		**1%**		
North Fork Valley	140200 040403	Bear Creek-North Fork Gunnison River	12,286	12,170	99%	59	0	59	39		0	39		**1%**		18
North Fork Valley	140200 040403	Bear Creek-North Fork Gunnison River	30,289	10,934	36%	53	1	54	29		0	29		**1%**		
North Fork Valley	140200 040407	Miller Creek	34,746	21,121	61%	128	901	1,029	38		0	38		**5%**		
North Fork Valley	140200 040505	Headwaters Leroux Creek	28,416	22,185	78%	89	94	183	54		0	54		**1%**		
San Juans Total						**2,371**	**1,714**	**4,084**	**2,929**	**29**	**10**	**2,967**	**168**			
San Juans	140200 020901	Silver Jack Reservoir-Cimarron River	37,710	37,640	100%	103	68	171	125	0	0	125		**1%**		26
San Juans	140200 020902	Upper Cimarron River	18,973	8,515	45%	40	16	56	9		0	9		**1%**		184
San Juans	140200 020903	Headwaters Little Cimarron River	27,413	17,580	64%	87	500	588	330	6	6	342		**5%**		**56**
San Juans	140200 060101	Headwaters Cow Creek	31,776	27,742	87%	22	112	134	36		0	36		**1%**		
San Juans	140200 060102	Lou Creek-Cow Creek	37,328	12,269	33%	54	0	54	42		0	42		**1%**		

San Juans	140200 060203	Headwaters Uncompahgre River	25,818	17,484	68%	141	2	143	34		0	34	14	1%		
San Juans	140300 030103	South Fork San Miguel River	11,933	7,269	61%	329	44	372	21		0	21		5%		
San Juans	140300 030106	Headwaters San Miguel River	33,071	18,905	57%	530	1	531	516		0	516		6%		
San Juans	140300 030108	Fall Creek	26,850	13,181	49%	73	3	76	237	1	0	238		2%		16
San Juans	140300 030301	Saltado Creek	12,953	1,861	14%	17	10	27	205	1	0	206		13%		
San Juans	140300 030302	Headwaters Beaver Creek	23,546	22,212	94%	221	437	659	901	10	1	912		7%		
San Juans	140300 030303	Turner Creek-Beaver Creek	25,586	4,982	19%	53	140	193	136	7	0	143		7%		
San Juans	140300 030305	Specie Creek-San Miguel River	24,682	6,597	27%	42	177	219	157	0	0	157	147	8%		
San Juans	140300 030401	Headwaters Naturita Creek	56,071	15,625	28%	105	497	602	155	4	0	159	7	5%		
Uncompahgre Plateau Total						**6,492**	**26,344**	**32,836**	**16,159**	**19**	**11**	**16,189**	**3,372**			
Uncompahgre Plateau	140200 050201	Upper Roubideau Creek	33,346	32,856	99%	197	584	780	1,780	6	1	1,788		8%		
Uncompahgre Plateau	140200 050202	Potter Creek	36,584	20,516	56%	310	653	964	384	0	0	384	398	9%		
Uncompahgre Plateau	140200 050203	Middle Roubideau Creek	27,986	18,116	65%	94	195	289	541	1	0	541		5%		
Uncompahgre Plateau	140200 050204	Cottonwood Creek	29,988	9,652	32%	392	470	863	70		0	70	130	11%		
Uncompahgre Plateau	140200 050301	Middle Fork Escalante Creek	21,508	20,804	97%	64	480	545	784		0	784	54	7%		381
Uncompahgre Plateau	140200 050302	East Fork Escalante Creek	15,210	13,572	89%	39	73	112	327		0	327		3%		
Uncompahgre Plateau	140200 050304	East Fork Escalante Creek	20,443	19,023	93%	554	274	829	114		0	114	273	6%		
Uncompahgre Plateau	140200 050305	Dry Fork Escalante Creek	30,933	15,795	51%	354	815	1,168	236		0	236	243	10%		
Uncompahgre Plateau	140200 050401	Smith Creek-Big Dominguez Creek	22,878	20,567	90%	189	272	462	1,008		0	1,008	195	8%		
Uncompahgre Plateau	140200 060403	Happy Canyon Creek	38,456	4,673	12%	51	362	413	431		0	431		18%		
Uncompahgre Plateau	140200 060501	Headwaters Dry Creek	33,992	10,980	32%	228	473	701	1,538	3	4	1,546		20%	Yes	
Uncompahgre Plateau	140200 060601	Upper Spring Creek	16,999	15,411	91%	253	927	1,181	1,768	5	5	1,778	137	20%	Yes	
Uncompahgre Plateau	140200 060602	Middle Spring Creek	21,667	1,488	7%	60	142	202	98		0	98	26	22%	Yes	
Uncompahgre Plateau	140300 030201	Upper Horsefly Creek	29,058	11,830	41%	140	285	425	2,555		0	2,555		25%	Yes	
Uncompahgre Plateau	140300 030202	Middle Horsefly Creek	17,876	16,971	95%	189	487	676	1,085	2	0	1,087	29	11%		
Uncompahgre Plateau	140300 030203	Lower Horsefly Creek	25,030	21,034	84%	274	1,771	2,045	353	1	0	354	102	12%		

Uncompahgre Plateau	140300 030304	McKenzie Creek	30,342	12,499	41%	220	615	835	142		0	142	**488**	**12%**	
Uncompahgre Plateau	140300 030306	Clay Creek	15,604	13,720	88%	160	168	327	577		0	577	**304**	**9%**	
Uncompahgre Plateau	140300 030601	North Fork Tabeguache Creek	11,624	11,624	100%	114	327	441	106		0	106	**23**	**5%**	
Uncompahgre Plateau	140300 030602	Headwaters Tabeguache Creek	27,263	25,713	94%	215	1,273	1,488	1,055		0	1,055		**10%**	
Uncompahgre Plateau	140300 030604	Spring Creek	13,504	4,643	34%	51	0	51	19		0	19		**1%**	
Uncompahgre Plateau	140300 030605	Campbell Creek	17,723	7,309	41%	20	509	529	19		0	19		**7%**	
Uncompahgre Plateau	140300 030701	Cottonwood Creek	32,749	26,848	82%	344	1,576	1,920	984		0	984		**11%**	
Uncompahgre Plateau	140300 040101	North Fork Mesa Creek	35,216	12,066	34%	128	372	501	27		0	27	**82**	**5%**	
Uncompahgre Plateau	140300 040102	South Fork Mesa Creek-Mesa Creek	30,345	6,417	21%	52	125	177	51		0	51	**114**	**5%**	
Uncompahgre Plateau	140300 040301	Headwaters West Creek	32,705	20,333	62%	103	17	120	8		0	8	**519**	**3%**	
Uncompahgre Plateau	140300 040402	Calamity Creek	30,081	19,199	64%	144	1,360	1,504	38		0	38	**205**	**9%**	
Uncompahgre Plateau	140300 040403	Blue Creek	24,685	12,491	51%	71	89	160	43		0	43	**50**	**2%**	
	Grand Total		**5,064,272**	**2,942,420**	**58%**	**25,066**	**60,853**	**85,919**	**53,650**	**153**	**42**	**53,846**		**5%**	**5,417**